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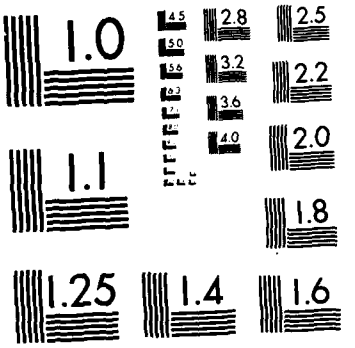

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SDI: A POLICY ANALYSIS

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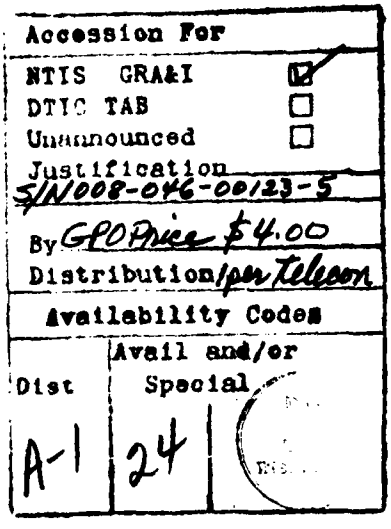

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SDI: A POLICY ANALYSIS

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Preface

When on March 23rd, 1983, President Reagan announced a new program intended eventually to make nuclear weapons "impotent and obsolete," he created, deliberately, a sea-change in the ongoing discourse about American and Western security policy. Military specialists, civilian experts of various schools of thought, and the general public all found in succeeding months and years that the term of the discourse had been altered. The Strategic Defense Initiative (SDI, popularly known as "Star Wars") quickly dominated all debate about US policy for strategic weapons and for arms control.

The President's "dream," as he later termed it, of a future era of "Mutual Assured Survival" replacing the current era of Mutual Assured Destruction aroused widespread skepticism among the community of experts. But it also struck a deep chord among the public who, as many studies have shown, is uncomfortable with the idea of indefinitely continued MAD. The SDI evoked strong political support among many who saw in it a satisfying way of turning the corner, after decades in which America has been open to attack from a feared and powerful enemy. It also evoked guarded support from some (far from all) of the leaders of a "peace movement" that had been calling attention to the horrifying consequences of a nuclear war and seeking a world where that danger was effectively abolished.

The clash of skepticism and support evoked a new and consuming debate. The collision of a Presidentially-launched, technologically glamorous program spearheaded by a powerful new Pentagon office, and an ever-mounting criticism from a large part of the scientific and specialist communities, yielded an outpouring of new literature, formal and informal, classified and open. The 1980s have witnessed a confused, often heated, uproar over SDI.

Colonel Stephen Fought has performed a valuable service by bringing us this book, for it provides us with useful tools that can clear away some of the confusion, help reduce the uproar, and replace some of the heat with light. The tools in this book can help both supporters and opponents of SDI to discover what is ill-thought-through, as well as what is sound, in their arguments pro and con. His tools can focus the debate on those things that are real, are important, and must be decided wisely if security is to be enhanced.

A great deal of the contentiousness swirling around SDI has involved the question whether one or another version of it will be feasible. COL Fought comes at the question from another angle, one that focuses attention directly on some central policy questions. Assuming for sake of argument that some versions of it may be feasible for some purposes, and that several goals for SDI are possible, the questions are: What effects might various kinds or degrees of deployments actually have? How do those effects interact with other predictable elements of the strategic environment of the coming decades?

What overall outcomes might result, and how do these compare with what we really want?

To approach these questions, COL Fought develops a model. Though mathematical in spirit, the model requires few if any numbers or calculations. It is simple in its essentials and not difficult to understand. (It could well be used for teaching purposes.) Its main use lies in illuminating the logic of SDI's role in U.S. national security.

Various models of this sort might be possible, but the one he develops here has two particular strengths. First, it is entirely neutral "politically." By itself it does not favor either SDI's proponents or opponents. It is neither intended to favor either, nor does it contain any subtle or buried features that, in actual use, would nudge those who use it in one direction or the other.

Secondly, this model by its nature draws attention to the ways in which American and Soviet decisions affect each other. This quality makes it especially responsive to President Reagan's intentions, since the President's goal of a "defense dominant" world revolves centrally around the decisions that the two sides make interactively, and in the long run perhaps even jointly. The President himself pointed out this aspect of his goal to General Secretary Gorbachev in their Geneva Summit meeting of November 1985. Even before a defense-dominant world is approached, the value of either side trying to defend military targets (such as, perhaps, missile silos) also depends heavily on the size and character of the other side's offensive forces.

Each side's strategic decisions, made separately, can together create a situation that either *may or may not* have foreseen or planned. Drawing our attention to this fundamental fact, as this model does, makes the model very valuable. Both the "may" and the "may not" are significant. There is a possibility of the two sides foreseeing and planning the interaction, and designing their arms and arms control policies to achieve a desired result. There is also a possibility of the two sides not foreseeing the interaction, and blundering into an undesired result. The model makes both possibilities vivid for us.

Both new arms and new arms control are potential options for Washington and Moscow, and the model helps identify the likely effects of both. Even without explicit arms control agreements, the two sides have the option of coordinating, through informal understandings, their arms policies. Or either may have the option, under some circumstances, of creating strong incentives for the other to move in a certain direction even where it otherwise might have preferred a different direction. The model helps trace and clarify these possibilities and helps identify those circumstances where a unilateral effort strongly to influence the other side has prospects for success.

COL Fought was led into developing the model by the problems posed by SDI, and he applies it to SDI primarily. But as he notes the model is also applicable to offensive weapons, and to the interaction of offensive and

defensive systems. Indeed one of the most interesting features of the book is that, starting from an interest in SDI, he was led inexorably to conclude that enormous and growing importance surrounds one type of offensive weapon—the prompt hard-target-killing ICBM. His observations (which he emphasizes himself) about that weapon deserve all the more attention for the fact that he did not begin by seeking to analyze it.

After constructing his model step by step and demonstrating some of its applications, he goes on in succeeding chapters to explore, in a variety of interesting and useful ways, various issues that it raises. His main conclusions are succinctly summarized in his Executive Overview and need not be repeated here.

The only chapter of the book that is moderately technical (Chapter 8) needs to be technical because it yields a conclusion that is not obvious. An SDI system's effectiveness need not be high, indeed it can be surprisingly low, yet it may render the attacker's problem extremely difficult under certain conditions. Those conditions come into play when the attacker can assign only a limited number of weapons to a given set of targets, and seeks a definite level of confidence that a given (presumably high) percentage of those targets will be destroyed. These conditions do not apply, of course, to attacks on cities in a world like today's, when both sides have a great many weapons, many of which can be reserved for city attacks. But these conditions could apply in some military situations today where an attacker is able or willing to assign only a relatively few weapons to some military targets. These conditions might also apply to a hypothetical future world in which disarmament in offensive weapons had left a potential attacker only a limited number of weapons even for striking cities.

At least one other feature of this book deserves special mention. That is COL Fought's important analysis of the implications of SDI for NATO doctrine. He brings a fresh and powerful perspective to that much-discussed subject.

NATO doctrine revolves around making a deterrent threat that the Soviets find "incalculable." For reasons brought to light in Chapter 9, the deployment of SDI (and/or antitactical ballistic missile systems using some SDI technology) may greatly reduce the "incalculability." SDI-type deployments may tremendously reduce, even eliminate, the real potential for tactical as well as strategic Flexible Response. With the loss of incalculability and Flexible Response, NATO may lose the linkage between conventional defense and nuclear deterrence. Thus the very fundaments of NATO policy must be rethought. COL Fought recommends, as an alternative, exploration of non-threatening, defensively-oriented *conventional* force postures (sometimes called "nonprovocative defense" or "defense-only defense").

In a final "Synthesis" chapter, he draws may of the book's threads together into specific policy recommendations regarding SDI, the ABM Treaty, and offensive counterforce weapons.

COL Fought has presented many of central themes of this book in numerous high-level briefings he has been asked to give in Washington, NATO headquarters and various European capitals. Those in the policy community who are already familiar with COL Fought's main points will welcome this book as a fuller and more complete presentation of them and the reasons for them. A much larger audience in the policy community, in research institutes and the academic world and beyond, will also welcome this book as a powerful new illumination, not only of SDI but of much else as well.

Richard Smoke
Brown University

Acknowledgements

This effort began as an attempt to learn how to "teach" about the Strategic Defense Initiative (SDI) at the Naval War College. Brown University, through their Center for Foreign Policy Development, offered several courses which were useful in expanding my horizons. Dr. Dan Caldwell, in his graduate course on Arms Control, spent many extra hours with me, ripping to shreds my preconceived notions and building basic knowledge of the strategic nuclear arena. Dr. Richard Smoke spent the next year with me during two independent research courses on a painstaking effort to translate my ideas into a coherent paper which was published by the *Naval War College Review*. There were many false starts, and several disagreements over interpretation of history, theory and "what the President said." I was most impressed with Dr. Smoke's intellectual honesty, for, even when we disagreed, he only insisted that I document and defend my position—not that I accept his. I must say, however, that on the history and theory he was habitually correct which, in turn shaped my perspective. In addition to the many hours he spent helping me formulate my opinions, Dr. Smoke has also graciously provided the preface to this manuscript.

During this entire process, the command structure of the Naval War College afforded me considerable time "off campus" to perform the research. For this, I am indebted to the NWC Presidents, Admirals Service, Marryott and Baldwin, to my department chairman, Dr. Turcotte, my immediate supervisor, Dr. Lloyd, and to my fellow instructors who very often picked up the extra teaching load. Captain Watts, the Deputy to the President, deserves special mention because, throughout all of this, he personally encouraged me, trusted me to represent the Naval War College on conferences and provided command level continuity on the effort.

As part of the research, the United States Information Agency saw fit to sponsor three extensive speaking trips, two to Europe and one to South America. There I had the opportunity to step onto the firing line and present my ideas in their raw form. I learned a tremendous amount from these exchanges and have included many features of the international debate in this manuscript. What little I contributed to the general discussion was paid back in spades by the trust demonstrated by USIA and their dedication to free and open debate among allies.

Throughout this entire effort the staff support I have been given at the Naval War College has been superb. The Graphic Arts Division, under Mr. Ian Oliver, must hate these charts by now; as my ideas matured, the charts changed. Yet on every occasion these people were enthusiastic and helped me tremendously in translating my thoughts into visual presentations (no simple feat). The Center for Naval Warfare Studies, through Mr. Uhlig, provided the funds for the initial article, and I am grateful to Bob Laske for his

assistance in the initial editorial process. Nancy Williams of the Center for Advanced Research typed and retyped the product several times, and through the efforts of Lu Cabeceiras and her fine publications and printing department staff, this final product emerged. Finally, the Naval War College Foundation saw fit to provide a substantial grant for the completed manuscript which allowed for more complete distribution.

This project could not have been completed without any or all of the people mentioned. Beyond these individuals and organizations, the officer class members of the Naval War College provided their inputs as did numerous individuals who read the *Naval War College Review* article or heard the various presentations. I have received comments ranging from: "Nice job, clear, and I finally understand SDI;" to "Obscure and unfocused, I have no idea what you are trying to say;" to "I understand perfectly what you are saying, and it is dead wrong." I suppose that is what makes it interesting and what drove me to complete this manuscript. In that light, I actively solicit comments from any reader.

STEPHEN O. FOUGHT

SDI: A Policy Analysis

Part I
Background

I
Foundations of Deterrence

The purpose here is to give common definition to essential terms as well as a short history of U.S. strategy pertaining to nuclear weapons.

As adversaries the United States and the Soviet Union compete through spheres of influence on a global basis, and it is in light of this competition that each nation's security arrangements must be considered. For these superpowers, the mechanisms for projecting influence and protecting interests run the gamut from political maneuvering, to economic leverage, to employment of military forces. However, given the advent and extensive growth of nuclear weapons, superpower relations are always judged against the possibility that these competitions might escalate to a central system nuclear exchange.

As with traditional balance of power relations, the superpowers have sought greater security through alliances, buffer states, surrogate forces and mutual defense pacts. For the United States, the principal alliance is NATO. Formulated around geographic necessity and to take advantage of a more robust Western economic and demographic base, this alliance allows Western nations to roughly match Soviet military capabilities. In exchange for a forward defense in Europe, the United States provides a "nuclear umbrella" over the European theater by linking a potential strategic nuclear system response to Soviet aggression into NATO Territory.

Expanding economic interests and increased Soviet worldwide activities have caused the United States to extend that nuclear umbrella to other regions, albeit often without the corresponding formalized security relationship. Development of this coalition strategy, and the associated U.S. guarantee of retaliation for Soviet aggression against friendly countries, has been the cornerstone of U.S. security policy.

While these formal and informal alliances are designed to strengthen U.S. security, they also present problems and challenges that are the product of coalitions. Still, from the perspective that the United States cannot, without distasteful social sacrifices, match Soviet global military capability, forward defense and the coalition strategy are deemed essential to U.S. success in superpower competition.

But, *both* the United States and the Soviet Union have global interests, global military capabilities and the ability to destroy that same globe should those interests and capabilities ever come into unresolvable conflict. The fundamental security objective of the United States, then, relative to the Soviet Union, is deterrence—preventing the use of force or coercion against ourselves, our allies or other nations of vital interest to the United States.

By "linking" conventional aggression with a potential nuclear response, a logical chain of events can be constructed which supports a conclusion that peace benefits Soviet national interests more than war. Given this state of affairs, the respective interests of the superpowers should not be so threatened that war would occur; thus, superpower competition can continue at the peaceful and nondestructive level.

This nuclear linkage is sustained with the adoption by the United States of a policy that it will never initiate aggression, of any type; but, the United States reserves the right to respond to aggression with any weapon suitable to the situation (more properly termed "incalculability"). Given that this policy applies to both attacks on the United States and friendly nations, and that conventional aggression could be countered with an escalation to nuclear weapons by the United States, the objective of deterrence is more correctly termed "extended" deterrence in both the geographic and philosophical sense.

The ability of the United States to control conflict escalation, to select the level of response to its advantage or the initiator's relative disadvantage, then becomes a crucial element of force structure. To achieve extended as well as fundamental deterrence, the United States must be perceived as having a retaliatory capability which is both: capable of inflicting the desired, unacceptable, level of damage on an aggressor; and, credible, in terms of selecting that option which meets societal norms attributed to the United States. It is this second criterion which established flexible response and the concept of escalation control.

When the United States was the sole, or clearly dominant, possessor nuclear weapons, massive retaliation was a credible strategy because the consequences to the United States of carrying out this strategy were believed to be insignificant. However, as the Soviets approached a position of essential equivalence, it became necessary to construct retaliatory options below the complete central system exchange. Initially developed under President Kennedy, but extended by all subsequent Administrations, flexible response

is comprised of many categories of options and levels of response. While options are designed to add credibility, they also imply an attempt to control escalations below the level of mutual suicide. Options can allow either: maintenance of a certain level of conflict, in other words response in kind; or, one to achieve a specified degree of damage, military superiority or dominance from which favorable war termination is theoretically possible.

Whether or not escalation control is actually possible is a matter of conjecture. Many experts argue that, once a nuclear exchange is initiated, only chaos and a central system exchange can follow—leading to a conclusion that flexible response tempts disaster. Others argue that lower level options add credibility and that only lower level options would allow survival and war termination, should deterrence fail. But the fact of the matter remains that escalation control concepts apparently are deeply embedded in U.S. strategy and force structure.[1]

The essence of deterrence is that neither party will be able to perform a rational calculation for gaining an advantage through aggression under any circumstance. Ideally, all levels of potential aggression could be met with response in kind; however, historically the United States has depended upon the threat of nuclear escalation to cope with anything more than ambiguous aggression. Given this relationship, which is likely to continue, it is sensible to analyze deterrence from the aspect of central strategic systems and treat all other retaliatory options as links to this base.

It becomes fundamental to the calculus of deterrence that nuclear forces be specifically structured to create a perception that aggression allows nothing to be gained and, potentially, everything to be lost. In the strategic nuclear arena, the present premise of deterrence is violated if: either party can calculate, under any circumstance, gaining a permanent advantage by initiating a limited nuclear exchange; or, either party can calculate a scenario by which a total nuclear exchange could be "survived," in a meaningful sense.

In structuring strategic nuclear forces, this relationship can be achieved by combining any of the following concepts of retaliation:

Assured Punishment. Using offensive forces, a potential attacker is held at bay by the guarantee that, even if the military objective sought is obtained, the price extracted in return by the defender will be well beyond any rational calculation of the gain achieved. This inherently demands a countervalue offensive, retaliatory capability.

Assured Denial. A potential aggressor is denied his objective because the effectiveness of the aggressor's forces are countered, thus introducing a concept of "counterforce." Two general approaches can be integrated to implement this concept: First is denial of objectives by *use of offensive forces*—this implies a mode of counterattack. In order for this to be perceived as effective, security experts generally agree that some sort of warfighting

capability must be created to deal with the unpredictable nature of potential aggression. This approach is described as "*offensive-counterforce.*" A second consideration is the denial of objectives by use of *defensive forces*. Effective implementation of this concept, in its pure form, would dictate defending all possible objectives from all forms of attack. Within this latter approach, either *passive* or *active* means of defense can be employed. In the nuclear arena, passive defense constitutes offense-negating techniques, such as dispersal of targets, hardening, etc.; while the weapon may arrive, its effects on the target are greatly diminished. Active defense employs methods of destroying the nuclear weapon before it detonates. This approach, whether passive or active, is termed "*defensive-counterforce.*" The following table summarized these choices:

Mechanisms for Deterrence

A. Punishment (Offensive/Countervalue)
B. Denial of Objectives (Counterforce)
   (1) Offensive
   (2) Defensive
      (i) Passive
      (ii) Active

There are mixes of these concepts in the existing approach to nuclear deterrence. In the absence of an ability to implement defense on a grand scale, nuclear deterrence has traditionally been based on the threat of punishment; this spawned a supporting force structure which is primarily offensive with countervalue targets. Countervalue, in the usually accepted sense of the concept, implies retaliation on urban and industrial (recovery) targets in exchange for aggression. Assuming the aggressor values his urban/industrial complex, it appears easy to extract an extreme price for aggression. Most experts agree that this can be accomplished with a fraction of the weapons now possessed.

However, deterrence through the threat of punishment runs headlong into moral issues of targeting centers of population. This concern, among others, is at the center of the debate as to whether nuclear weapons are, or can ever be, congruent with western societal norms. In fact, many historians reviewing now declassified documents on U.S. nuclear strategy quickly point out that military planners attempted to focus on military targets (counterforce) while accepting, as a collateral function, rather massive estimates of unavoidable nonmilitary casualties.

Flexible response in both strategic and alliance theater forces, induced a shift away from deterrence by threat of punishment. Even as early as the 1960s nuclear targeting in the European theater was presumably counterforce (counter-*conventional* force specifically). Soon technical improvements, such

as increased accuracy and speed of delivery as well as numbers, allowed strategic offensive forces to be potentially targeted against nuclear systems targets. Such developments were probably inevitable; technical developments either permitted, or were responsible for the evolution from a deterrence role to one of offensive denial. Although the specific motives for this shift can certainly be debated, there seems little reason to doubt that the trend conforms to the historical development of military strategy and supporting weapons to inflict military damage, minimize civilian casualties and collateral damage, and improve the efficiency of weapons in general.

In the case of the United States, a mechanism for denial of objectives is probably more credible because of the often demonstrated public abhorrence of nuclear weapons and the emergence of powerful Soviet nuclear forces. Basing even fundamental deterrence on punishment implies conceding the objective at an unacceptable price; but in today's world, it means paying that same price yourself. The viability of the "punishment" approach erodes even further when considering extended deterrence—in fact, even the Europeans have expressed serious doubts that the United States would "trade Bonn for New York."

On the other hand, employing an effective counterforce strategy would provide a capability to limit damage because Soviet retaliatory capability would be, by definition, reduced. Although an offensive-denial approach would probably add credibility to deterrence (it is congruent with societal norms), it also raises doubts about the intentions of the nation possessing the capability by, possibly, introducing a prospect of "disarming" an adversary in a first strike.

As mentioned above, technical improvements in nuclear weapons opened the door for this potential shift in strategy. For example, Jeffrey Richelson's article "PD-59, NSDD-13 and the Reagan Strategic Modernization Program" (*Journal of Strategic Studies*, June 1983) indicates that deterrence by denial of objectives (offensive counterforce) clearly dominates current U.S. retaliatory conceptional thinking and decisions on force modernization. The following is extracted from Richelson's article:

> PD-59, which bore the title "Nuclear Weapons Employment Policy," altered US strategy for a large-scale nuclear war in two basic ways. First, it mandated a shift in target emphasis from the economic recovery targeting mandated by NSDM-242 to the targeting of Soviet political and military assets, strategic military targets, leadership targets and Other Military Targets (OMT). Hence the destruction of 70% of the Soviet economic recovery base would no longer be the prime objective of US nuclear forces.

Colin Gray offers further evidence, also presented in the Richelson piece:

> PD-59 said that deterrent effect is maximized if the Soviet leadership knows that the assets it values most are discretely at nuclear risk; that punishment of Soviet society, while an inevitable by-product of large-scale nuclear war, has little merit as a deterrent; and that a central homeland-to-homeland war could be protracted, with six months as the consensus guess for the

> duration of a protracted nuclear war. The assets of highest value in Soviet estimation are believed to be the domestic political structure and the military power of the state.

If one accepts Richelson and Gray as providing an accurate interpretation of PD-59, then one must question the utility of discriminating between countervalue and counterforce. According to most contemporary writers, countervalue targets have been considered to be urban/industrial whereas counterforce has been defined as military/leadership. Soviet actions, however, have caused U.S. leaders to reevaluate this partitioning and, again according to Richelson, the conclusion is that the Soviets *value* their military and leadership assets; thus, it becomes apparent that countervalue equals counterforce and the previous distinctions are purely academic. An underlying, philosophical, issue is how to construct a new targeting concept without also constructing a disarming first-strike capability; and how this can be accomplished without discrediting previous Presidential pronouncements that the U.S. nuclear forces, and all other elements of the military, are designed only to be used in *response* to aggression.

The Soviets appear to have pursued a similar path in strategy and force development. Although it is not possible to identify precisely their strategy, it is revealing to examine the capabilities present in their nuclear inventory. For example, the Soviet SS-18 system has the capability to deliver warheads of sufficient accuracy and yield to destroy U.S. Minuteman ICBMs. With over 300 of these weapons capable of delivering 10 warheads each, assuming a 2:1 ratio to "kill" the 1,000 Minuteman silos, the SS-18 system can "disarm" Minuteman by itself. Defense analysts point to the SS-19 and to the forthcoming SS-24 and SS-25 systems as increasing this capability. Given the dynamics of facing an ever increasing Soviet first-strike capability, the United States must take some sort of counteraction if deterrence is to be maintained.

Further evidence to support Soviet adoption of a "warfighting" strategy is their extensive civil defense system, (primarily for party and military leadership) a massive air defense system, and the continuing provision for relaunch capability in their ICBM silos. It is generally agreed that the primary reasoning for building in relaunch is for use in a protracted war scenario.

Adding to this dilemma is the offense capability of the Soviet Submarine-Launched Ballistic Missile (SLBM) force operating close to U.S. shores. These SLBMs could play a major role in "decapitation" by striking U.S. command and control centers, thus pinning down the Minuteman and giving the SS-18s a chance to arrive. There appears to be only one valid reason for the Soviets to maintain this combination of forces—to acquire a first-strike capability.

All of this has produced a dilemma in which the technical evolution of accuracy on fast delivery systems has allowed the mechanism of denial,

through offensive counterforce, to enter the deterrence equation. The reasoned findings that the Soviets place high value on their leadership and forces has caused offensive counterforce to now dominate U.S. deterrent theory. Yet this approach must be evaluated against previous eschewal of U.S. first-strike capability and public announcements on use. For the Soviets, equal or greater capabilities exist, and the nature of their internal debate concerning first-strike capabilities is largely a matter of conjecture. Nonetheless, both sides appear to be tending towards acquiring a disarming first-strike capability, with the United States being the more vocal in expressing dismay with this trend.

Given this shift in deterrence mechanisms, from punishment to denial of objectives through offensive counterforce, and the possibility that the premise of deterrence will be violated by this shift, it is reasonable to consider an alternative—the denial of objectives through defensive counterforce—as a solution to the dilemma we now face. In this light the SDI can be seen as a shift in the mechanism of deterrence from punishment or denial of objectives through offensive means, to denial of objectives through active defense.

In considering the defensive options as a means of denial of objectives, the Western world has accepted a presumption that nuclear war cannot be fought and won, probably not even survived; therefore, attempts at defense appeared illogical. To defend meant to contemplate survival which was contradictory to the premise of deterrence. Defense has thus long been considered "destabilizing" rather than prudent, and therefore largely abandoned. That the Soviets *publicly* accepted this concept is evidenced by the language of SALT I, both in the Basic Principles and in the ABM agreement; however, that they have not conformed to this principle is obvious by their defenses, of all categories, now in place.

The President's Strategic Defense Initiative, therefore, is not an attempt to replace deterrence, but is an alternative way to achieve the objective, in its entirety. The final condition should be *stable*, in that it does not require constant attention nor does it erode under crisis. It should be *mutual*, because the United States, having no territorial ambitions, can therefore accept being "deterred" by the Soviets, as long as the Soviets are similarly deterred. It should be *extended*, because the United States has vital interests throughout the globe upon which its survival depends. The objective of extended deterrence in a stable environment while providing mutual security for both superpowers, will be considered definite through this paper.

Note

1. Flexible response is further dissected in Chapter 7 by examining the basic question of "Can a nuclear war be limited?"

II
A Model for Stability

We focus here on a crucial modifier of U.S. strategy, stability, and use it to build a model of superpower nuclear relations.

The remainder of this analysis will be concerned with developing a theoretical model to portray various aspects of the superpower nuclear balance. SDI will be superimposed on this theoretical model to examine how the particular characteristics of defensive counterforce might be incorporated with other capabilities to achieve the objective of a stable, mutual, extended deterrence. Additionally, the views of proponents and opponents of SDI will be specifically considered in the context of the model provided. Finally, an attempt will be made to describe how the theoretical model might differ from "reality" and how this sort of approach could be used to facilitate the arms negotiation process.

As stated in the beginning, deterrence is based on an arms climate in which no adversary is able to develop rational calculations whereby he can commit aggression with confidence; further, there must always be *time* in a crisis to perform that rational calculation. In the strategic nuclear arena, the ideal of "stable" situation can be reduced to the linear relationship shown in Chart 1 (labeled "perfect stability"). The number of weapons deliverable is plotted as a function of time to measure stability. Obviously, retaliation options are more complex and depend on intricate force structure and execution capability. However, if the proper force is provided, then the number of weapons deliverable over time becomes a useful, though imperfect, proxy to examine stability.

If this curve is flat, meaning there can never be a decay of retaliatory capability, then a crisis situation is stable- or at least the strategic inventory does not cause it to be unstable. In this situation, a nation could simply build the number and type of weapons required to deter the opponent, then cease, having guaranteed the retaliatory capability under all scenarios and over all relevant time. The number of weapons possessed would then equal the number of weapons which could be delivered.

However, if an opponent has an ability to decay this retaliatory curve by an attack, as in Chart 1, the defender may face a critical decision either in a crisis or under attack. At some point along the decay curve, the ability to "deter" (i.e., inflict the damage/deny the objective in accordance with the deterrence

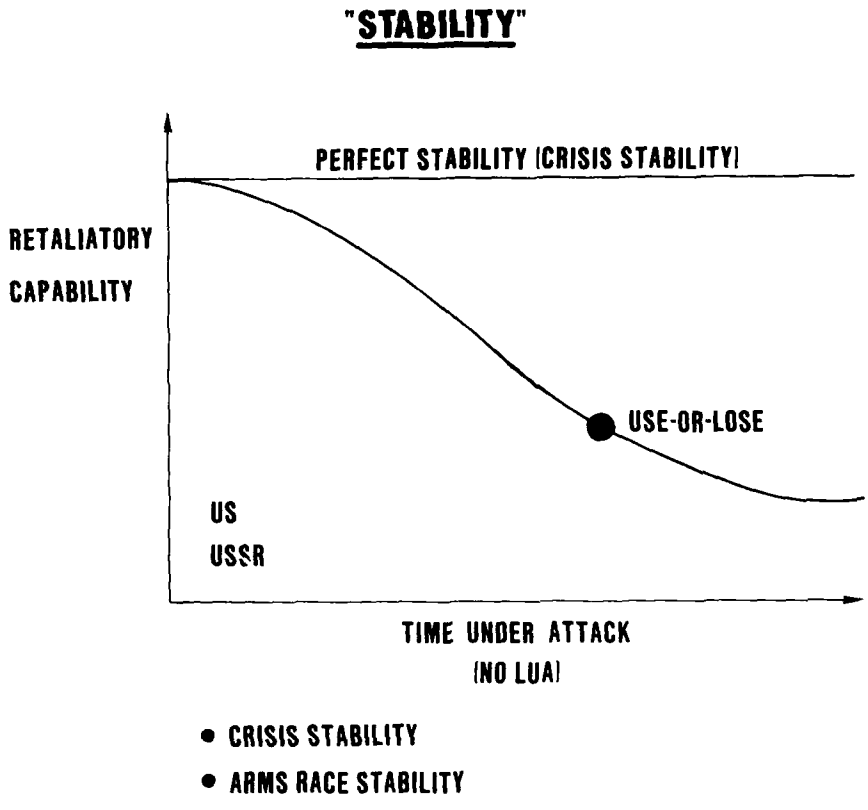


Chart 1

plan) may depend on using the weapons before they are lost. The "use it or lose it" dilemma[1] or the perception that it exists, creates a dangerous type of instability which, for the purpose of this discussion, will be defined as *crisis instability*. For the United States, the "use or lose" point would be that level of weapons below which flexible response, in the exhibited conflict scenario, would no longer be possible. (See Chart 1.)

Military planners make these sorts of calculations, represented by these curves, in order to size forces and allocate scarce resources. Further, since strategic nuclear, (fundamental) deterrence is the foundation of extended deterrence, correcting a decay in the retaliatory curve often receives immediate attention. There are three general alternatives to correct, or raise and flatten the curve:

1. *Build more offensive arms.* This is a known and single-actor solution. This has the effect of raising the origin of the curve, resulting in a parallel decay, but at a higher residual force at each point in time; the net effect is to delay the "use or lose" dilemma. If the new offensive arms are also less vulnerable, the curve will also flatten out.

2. *Negotiate.* Identify the threat to your opponent and negotiate to have it removed. If it is eliminated, the curve returns more nearly to the original position of Chart 1.

3. *Defend the existing forces.* By either active or passive means, negate the effect of the offensive counterforce weapons that decay the retaliatory curve—thereby shifting the curve to some position that reflects the effectiveness of the defense. [Recall that passive defense diminishes the damage effectiveness of the weapon on the intended target whereas active defense prevents the weapons from arriving at the target. Most of the concepts being, considered in SDI are types of active defenses.]

Each of these approaches could produce satisfactory results, and, in fact, the three approaches are not to be considered independent but should be seen as blended and complementary. Although the Reagan administration has termed the negotiation process "fatally flawed" because it has focused on creating a balance of unstable forces, there is nothing to prohibit the process from working, given that both parties are interested in a solution and are able to arrive at some agreement on the problem definition. Building additional offensive forces has been the most often selected route to correct a decay in retaliatory capability. The more dramatic the change in balance is perceived, the more apt the superpowers have been to adopt this approach (missile gap, window of vulnerability, etc.). Passive defense has also been incorporated in, but has not dominated, decisions on force structure. Although hardening of sites, dispersal of aircraft and concealment of SLBMs is a major part of the U.S. TRIAD, increases in Soviet offensive capabilities have generally outpaced a pure passive defense option. Active defense has also been used, for instance the air defense networks and the ABM site around Moscow; but, in general, technology has prohibited widespread dependence on this option, especially for the United States. Thus for reasons of technical feasibility, difficulties in the negotiation process and the advantage accorded to nuclear offensive forces, increasing offensive forces had been the most often selected option for both the Soviets and the United States to satisfy their concerns about retaliatory capability.

The difficulty in dealing with the problem is the dynamic of the interplay as each side seeks to correct its own perceptions of the problem. If one side corrects its retaliatory decay curve in a manner which delays the other's curve, a response is induced. If the second side also responds in a manner which decays the first party's curve, then another response is induced; the process goes on and the result is a progressive arms race.

Thus for our discussion here there are at least two types of stability. Crisis stability, as defined previously, is the basic element in deterrence. The manner in which the parties resolve their own perceptions of crisis stability will determine whether or not arms race stability is created. Ideally, a solution could be reached creating both crisis and arms race stability.

However, if a choice has to be made, the crisis problem should receive priority. If the situation is crisis stable, even if by an iterative series of arms improvements, only resources are consumed. On the other hand, achieving arms race stability while retaining crisis instability may result in societies being consumed. Still, a simultaneous solution is sought.

Given this dynamic, it would now be useful to create a model integrating the two types of stability with the historical development of weapons and concepts of deterrence. Recognizing there are two curves (U.S. and U.S.S.R.), a three-dimensional model would be more representative. However, in the interest of simplicity, the "time" axis will not be portrayed; instead, it will be treated through description and repeated presentation.

The number of retaliatory weapons which can be delivered on the Soviet Union will be plotted against the number of weapons the Soviets can deliver on the United States. An assumption of the model is that neither party desires to initiate the exchange, thus the "number of deliverable weapons" for each party is designated for retaliation only.[2]

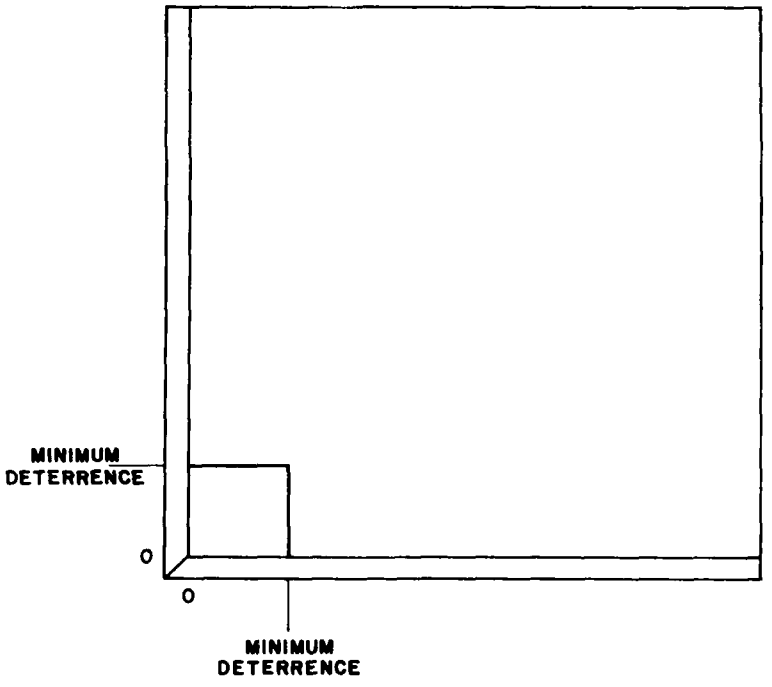


Chart 2

The first level imposed on the diagram (Chart 2) is the area of minimum deterrence. Drawing upon calculations made while Mr. McNamara was the Secretary of Defense, between 400-600 large, "dirty" weapons was sufficient to destroy between 50 and 75 percent of the Soviet industrial capacity. (It

should be noted that this is clearly a countervalue method of deterrence, using the classical definition of countervalue.) The Soviet industrial base has expanded considerably and passive defensive measures have been added, so a more representative number today could be as many as 1,000. But the point is, both the United States and the Soviet Union have well beyond whatever the number needed to achieve minimum deterrence based on the classic definition of punishment by massive retaliation—open source estimates of 9,000-10,000 strategic weapons in each inventory are generally accepted. The reader is reminded, however, that this is *not* the current U.S. strategy of flexible response and, most analysts concede, revision to this approach would also mandate a shift to fundamental versus extended deterrence. Still, this is an important conceptual threshold of nuclear deterrent theory and may be critical to consideration of SDI.

It should be noted that for our graphic purposes, the minimum deterrence area is drawn as a square. This is probably not an accurate portrayal because the Soviet industrial base is far more dispersed and difficult to damage than that of the United States. However, our purpose at this point in the analysis is to examine the "physics" of the problem, which can be done by assuming symmetry (a comparable approach to the frictionless ball or the weightless string technique from college lab calculations). After the physics are established, the "real world" can be used to shape the model, and at that point we should be able to manipulate the variables within the theoretical model to engineer the situation we desire.

Now, both parties have obviously built weapons well exceeding this first level of deterrence. The next area encountered in increasing the number of weapons is the region associated with SALT I, shown on Chart 3. There are several important features of this area of the model. First, all of the weapons are of the "stable" variety. That is, there is no offensive counterforce capability available. In other words, both parties' retaliatory curves (see Chart 1) were flat at the level of weapons possessed. The logic agreed upon by the superpowers at the time of SALT I was: given a guaranteed retaliatory capability at the level designed (flat curve, etc.); and, given that both powers were above the level of minimum deterrence; it should be possible to reduce the number of weapons in the inventories of both sides. Further proof of this reasoning is evident in the ABM Treaty where both sides agreed to only a minimal defense (against accidental or third party attack), thus ensuring the effectiveness of retaliatory forces by limiting defense. In coarse terms the logic of SALT I was: if you have excessive weapons; and, they can never be taken away from you; and, you can always deliver them; then you should be able to reduce their numbers. This logic still holds; however, the three circumstances which are present in the logic may no longer exist.

In reality, both parties have built beyond this conceptual level of SALT I and voided the logic on which reductions depended. While it can be argued

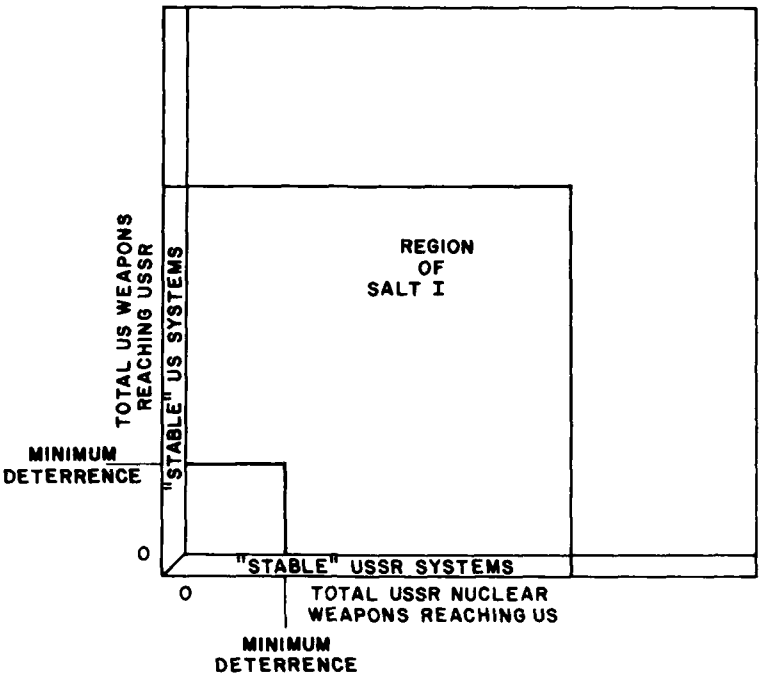


Chart 3

that the Soviets were the first to possess "unstable" weapons (SS-18), it is not the purpose of this paper to discredit either party. Our interest is to build a conceptual model that is useful to examine the nuclear systems environment.

As we continue in developing the model, it becomes apparent that to measure the exact number of "unstable" weapons introduced on each side is not really necessary. What is significant is to portray the next threshold where one side or the other could contemplate "disarming[3] the other side through an offensive counterforce first strike. This level is shown on Chart 4.

It is important to note that only counterforce weapons are "added" in the area between SALT I and "disarming," because counterforce weapons are the only ones that can provide the instability or decay in the response curve, as described in Chart 1. (If the United States or U.S.S.R. increases their arsenal of "stable" weapons, the SALT I area would expand.) Further, although counterforce weapons do not necessarily imply counterforce targeting, each side will assume that to be the case and will respond accordingly.

This completes the basic construction of the model; there are only three thresholds which concern us—first, minimum deterrence; second, the level of stable weapons and the associated logic from which reduction can be contemplated; and third, the level which, if reached, might allow one side to contemplate "surviving," winning or gaining an advantage in a first strike.

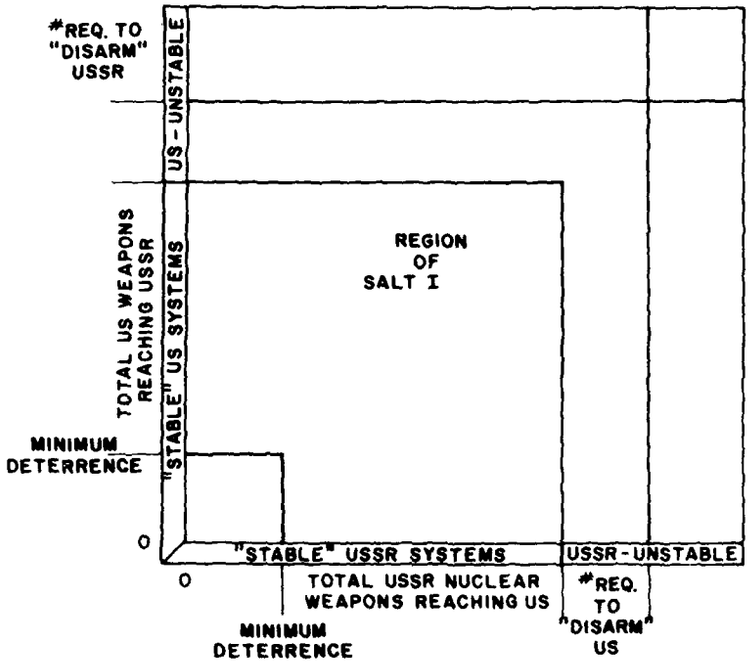


Chart 4

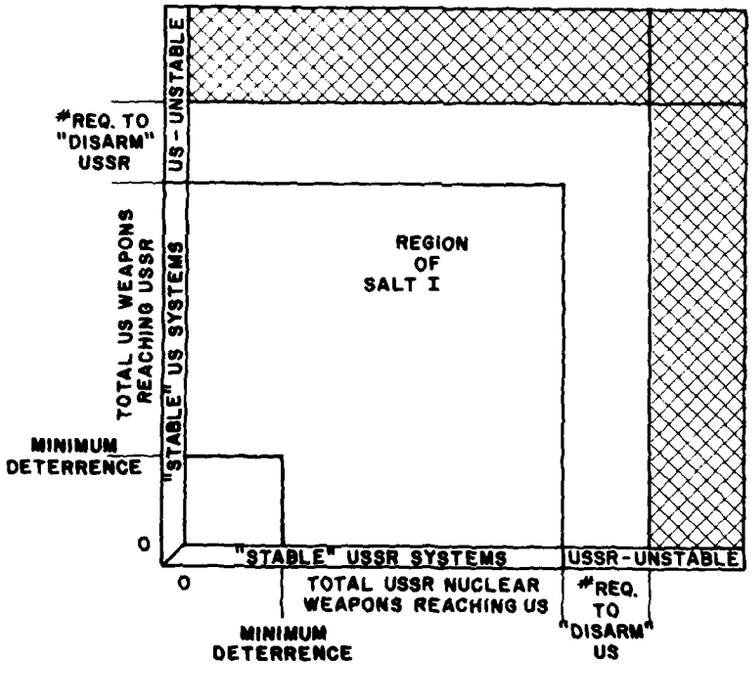


Chart 5

Given this last possibility, there are some areas of this model which should be avoided. The first of these zones is shaded in Chart 5.

The right-hand shaded area represents a region which, if entered, would allow the Soviet Union to "disarm" the United States. This, of course, must be avoided. But, because the United States also accepts a commitment to not attempt to achieve a capability to disarm the Soviets, the upper shaded area must be avoided as well. (United States' superiority, as described in this area of the graph, was formally discarded by its commitment to the basic principles in SALT I.)

The intersection of these two unstable regions, the upper right-hand corner, represents the most unstable region of all. In this case, both sides can achieve an advantage by a first strike and both sides thus incur a disadvantage by waiting to retaliate. Each side can disarm the other thus both sides possess a capability and an incentive to preempt. This is the most unstable region that can be contemplated and must be avoided because it violates the very premise of deterrence. This, in fact, is dynamic instability.

At the other end of the scale, falling below the minimum deterrence level may be equally imprudent. This violates the notion on which deterrence is based because neither side would have a capability of "destroying" the other, using something like the 50-75 percent industrial destruction calculation. Such a situation could make nuclear war "thinkable" because survival is no longer a key issue and the employment of nuclear weapons might be used with less hesitation in a crisis situation. Thus the left and lower boundaries are shaded as "unstable" in Chart 6 and should be avoided.

The lower left-hand corner of this chart is especially interesting as it represents the intersection of two regions of "survival" (i.e., both sides receive a retaliatory or initial blow less than the minimum deterrence level). This area represents and can be defined as the region of Mutual Assured Survival. We note that it is the intersection of two unstable regions which, unless demonstrated otherwise, is also unstable; entry into that zone must be examined very carefully. This area of "mutual assured survival" (MAS) is often discussed in the arguments over SDI in the context that nuclear war, in the MAS region, is now possible or, at some where near (0,0), the world is now "safe for conventional war." These are important, perhaps critical, issues which will be addressed more specifically in later chapters.

As described, the model is symmetric and composed of straight lines, but nuclear relations are permeated with emotions and perceptions. It is only reasonable to assume that these rectangular areas actually have some rather "fuzzy" boundaries. Although both parties have agreed to maintain a rough balance—a position along the diagonal in this model—perceived deviations from the diagonal are likely to generate correcting responses.

Attempting to define the "fuzzy" regions is difficult, but can be approximated if we first consider the zone between SALT I and the

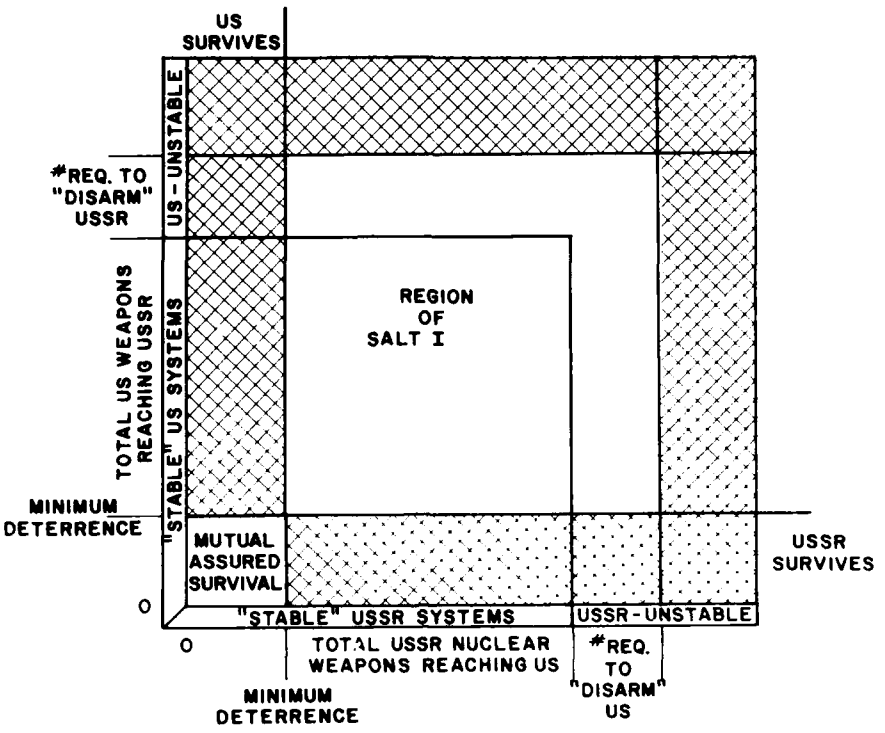


Chart 6

"disarming" level. We know, by definition, that the upper right-hand corner of the SALT I box is crisis and arms race stable. How far off that point crisis and arms race stability is retained is debatable. But, for the sake of our analysis, let us assume it can be maintained until a 20 percent imbalance is created. This situation can be illustrated by a line that connects these points with entry into the upper right-hand unstable region. It is postulated that the connection is made with a curve which bulges inward toward the diagonal because as unstable weapons increase in number, each side will calculate the other's capabilities in excess of actual ("worst case planning"). As the number of unstable weapons becomes smaller, i.e., approaching the SALT I region, the overestimation of capability becomes less significant. Chart 7 reflects this curve and the region to be avoided.

It is further proposed that, within the zone of SALT I, there is a similar "fuzzy" region, but that its shape is different. Specifically, it begins where the previous zone left off (in the absence of proof of discontinuity) but widens at first, then contracts and comes together at the outermost area of the Mutual Assured Survival area. The justification offered for this shape is derived from Chart 8.

At the far right of the scale, well above minimum deterrence, additional weapons do not provide a significant marginal return in deterrent value, thus

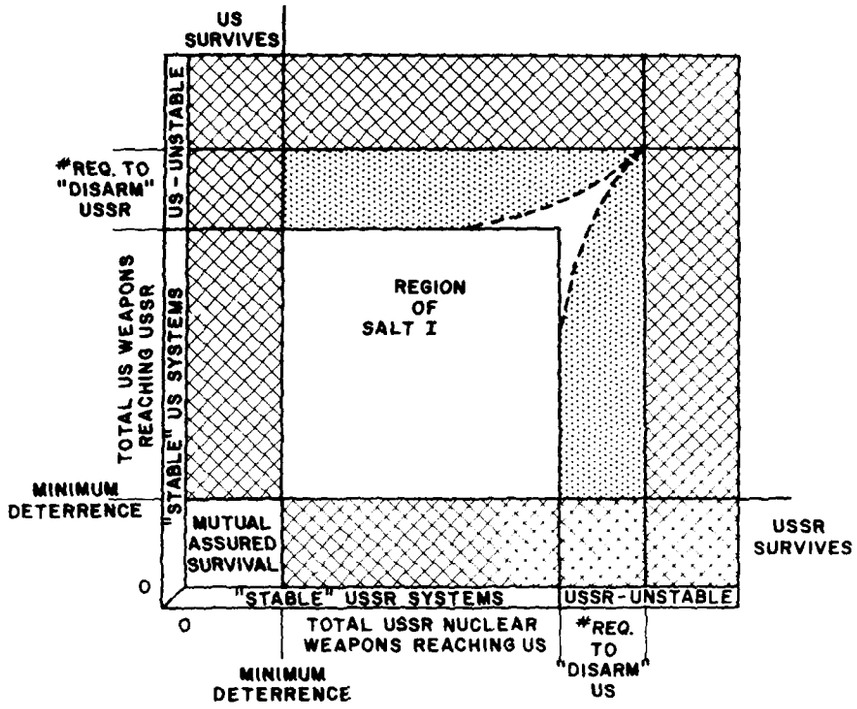


Chart 7

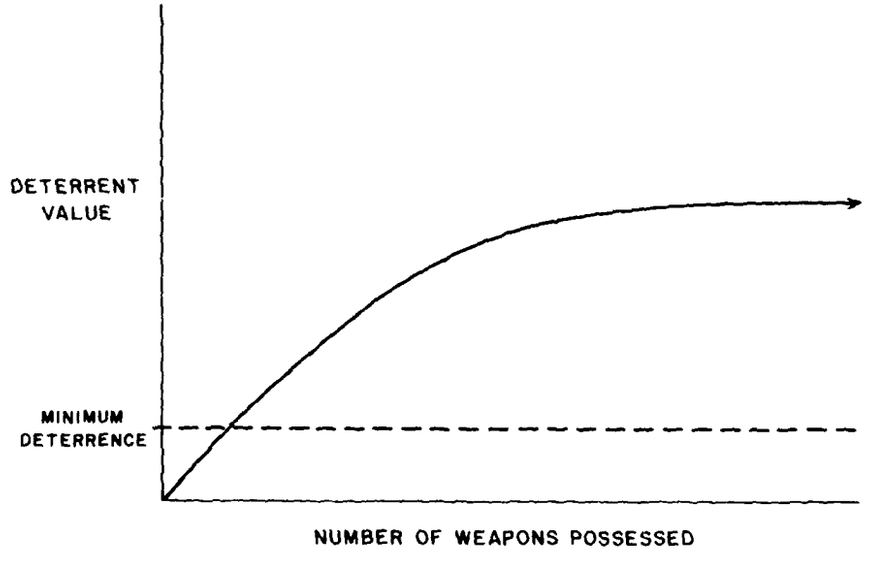


Chart 8

implying that an imbalance in weapons possessed (deliverable by the definition of the zone of SALT I) at these levels would have less of an impact than a similar numeric disparity at lower levels. As the number of weapons possessed is reduced toward the minimum deterrence level, there is less tolerance for deviation. The combination of these two observations leads to a curve which bulges out from the diagonal, creating an expanding, then contracting zone of stability as shown in Chart 9.[4]

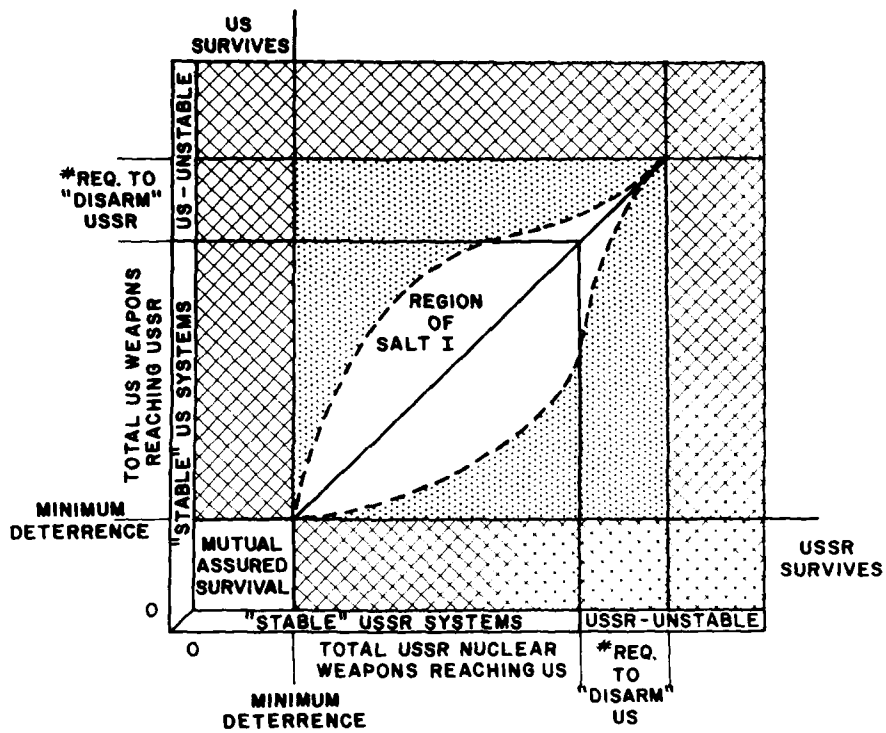


Chart 9

These new regions are shaded more lightly than the border regions because it is postulated that only arms race instability is exhibited. Specifically, if zero or low levels of counterforce offensive weapons are present, each side can, and will, resolve an imbalance with increased offensive forces. This leads to an interaction where crisis stability is maintained through an offensive arms race, as discussed in setting priorities between the different types of stability. Approaching the "disarming" line, however, can create the perception, albeit incorrect, of crisis instability. It would appear that these regions are formed by a combination of actual calculations and perceptions.

At this point the reader might aptly suggest that this model represents only the ballistic missile situation, hence is of only marginal use in evaluating the overall strategic situation. However, the author would argue against such a conclusion.

First, it is logical to conclude that the manned bomber leg of the U.S. TRIAD depends upon an ICBM laydown in order to penetrate Soviet air defenses—especially by the B-52. Further, the U.S. SLBM system is highly dependent on a compound control system to be effective. There is the possibility of a decapitating strike against the U.S. National Command Authority (NCA), thereby eliminating the requirement to destroy the launch platforms. (Studies to support the current modernization program acknowledge these problems.) Therefore, the ballistic missile/NCA element being at risk in the region between SALT I and the disarming level causes all forces to be included in the model. The much touted "synergism" of the U.S. TRIAD which greatly increases effectiveness when everything survives also compounds vulnerabilities when weaknesses exist. Also, approximately 75 percent of the Soviet strategic nuclear capability resides in their land-based missile systems. Their SLBM force may be at sufficient risk where the Soviets might contemplate keeping their submarines either in home port or in bastions near home waters; thus, taking on the characteristic of land-based ballistic missiles relative to flight time to U.S. targets. Therefore, even if the chart were purely for ballistic missile forces, it would include a preponderance of Soviet nuclear forces.

Second, the argument that only a small number of nuclear forces are necessary to perform deterrence assumes deterrence based on punishment, and is often associated with the minimum deterrence level. However, as postulated by Richelson, both powers have apparently abandoned the classical countervalue approach leading to an increased number of "residual" forces necessary to perform deterrence based on denial of objectives. Thus by changing the targeting strategy to support the deterrent objective, the minimum number of weapons required is likely to have increased dramatically above the 400 and 600 associated with McNamara's concepts.

Third, it is possible to plot all forces in the model by their relative stability or instability. As shown in this paper the positioning of the lines is static; but it becomes apparent that, as one side places the other's forces at risk, those forces at risk could become "unstable" because they must be "used or lost." By considering that a weapon system can be unstable, because it has either a disarming capability or a vulnerability, it is possible to shift or reposition the lines in the model and encompass all the strategic nuclear systems. The importance of including all weapons on this model will become more obvious as analysis of SDI is performed.

The author recognizes that the model's usefulness can be challenged on grounds of its simplicity, and that an "exchange model" is probably necessary to refine several important interactions. However, the purpose of the model is to create a rough representation of the strategic nuclear situation, focusing on both crisis and arms race stability, and to develop some theoretical base from which to evaluate the SDI. Acknowledging the shortcomings, it has

value in performing this task. In Chapter IV I will attempt to portray the "real world" and, of necessity, will incorporate some of the techniques of exchange modeling.

Notes

1. The "use or lose" point is associated with maintaining the strategy, which does not necessarily equate to being "disarmed."

2. This portrayal, therefore, represents a pre-attack position for both sides. A more thorough representation of the crisis/arms race stability dynamic clearly requires an exchange model. I do not feel, however, that the more elaborate interaction of dynamic modeling adds significantly to the conclusions that are possible with the far more easily handled static case. I, therefore, leave exchange modeling to the expert reader.

3. Again, "disarming" is a relatively vague term. One may associate it with either reducing the retaliatory blow to a level which can be "survived," negating the retaliatory strategy to a point where the party attacked will not respond or actually eliminating the capability to respond.

4. The change in concavity in the SALT I region is to reflect the "grey area" weapons which can be seen as stable, or unstable, under different circumstances—such as D-5.

III
Analysis of SDI/Stability

Given the model, we now examine various influences of SDI on the "theoretical" state of affairs.

To analyze SDI, it is necessary that we make a coarse determination of the current U.S. position in the strategic equation vis-a-vis the Soviets. As of 1986, we are certainly beyond the zone of SALT I and below the "disarming" level.[1] The Reagan administration would argue that we are in the middle ground, at a position which favors the Soviet Union; without the strategic modernization program the Soviets would push well into the disarming area. In this area, recall that we probably have crisis stability being maintained by arms race instability—an acceptable, but costly, situation. Rather than arguing the exact position at this time, we will select for analysis a point along the diagonal to reflect a "balanced" situation.[2] By selecting this position, we should be able to examine the "mechanics" of SDI within the model and can later return to a more accurate determination of the present position.

Chart 10 reflects this diagonal or balanced position and the upward arrow portrays the present trend in weapons deployments. Both superpowers have, for a variety of reasons, perceived decays in their respective retaliatory positions and resolved the problem by adding offensive weapons to their inventories. Further, the newer systems are of the counterforce variety with some degree of emphasis on *prompt* counterforce. To solve the "window of vulnerability" caused by the SS-18, the United States programmed M-X, D-5 and B-1; the Soviets in turn are adding the SS-24 and SS-25. It can be reasonably forecast that the Soviet systems will prompt another U.S. response which will, in turn, provide the rationale for further Soviet increases. Crisis stability, then, is maintained through an offensive arms race; the present situation is thus crisis stable but arms race unstable. Although this is satisfactory when crisis stability is considered to be the dominant variable, the direction and speed of the arms race is alarming. More specifically, as shown in Chart 10, the movement is accelerating toward the most unstable region—the upper right-hand corner.

Further, because the zone of instability in Chart 10 is concave toward the diagonal, the region of stability or margin for error in displacement from the diagonal lessens as the number of unstable weapons increases (i.e., as one

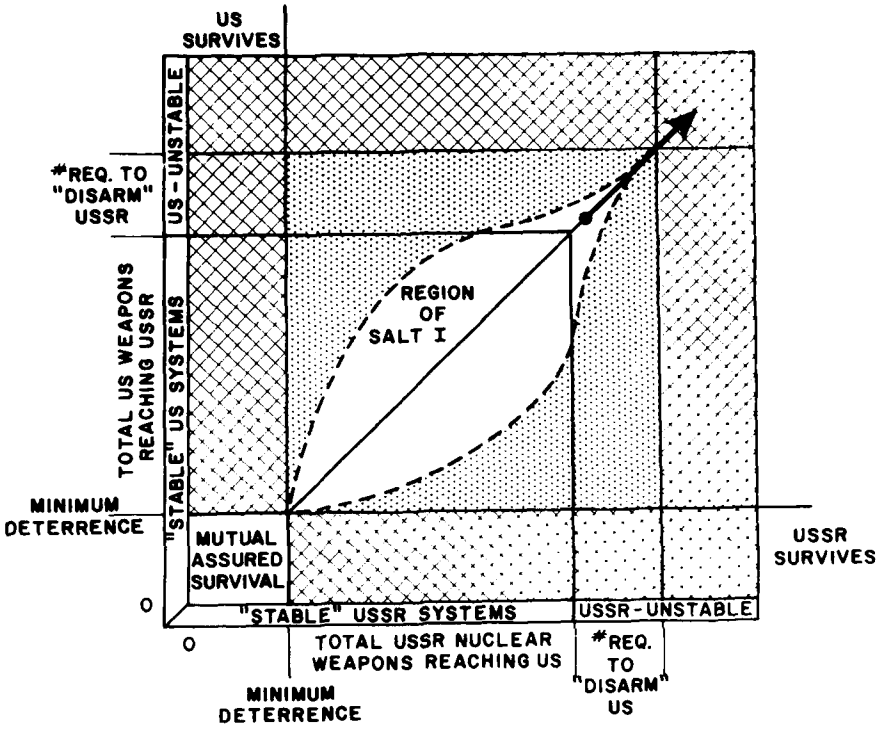


Chart 10

moves upward along the diagonal). Upward movement, even along the diagonal, approaches these unstable regions and accelerates the requirement to respond. At some point, it is conceivable that to approach or enter the upper right-hand area would make leaders vulnerable to the "clever briefer" who could make the case that a first strike was both possible and essential in a crisis.[3] The present strategic arms situation is not only getting out of hand, but the trend is of such a magnitude that honest concern is being expressed from a variety of political quarters.

The Scowcroft Commission appears to have recognized this and incorporated it into their M-X recommendation. While not openly conceding that the M-X was an unstable weapon, they prudently recommended that only 100 of them be deployed. This had the effect of raising U.S. retaliatory capability tenfold (over the replaced MM II) while not unduly increasing a "first-strike" potential. If the Commission had not recognized this interaction, it would have been logical to recommend that all MM II systems be replaced by M-X (450 missiles). As a long-term solution, the Scowcroft report recommended a mobile, single warhead, ICBM to provide both arms race and crisis stability without threatening Soviet retaliatory forces. From this perspective the M-X can be seen as a necessary, even though a forced,

decision and recognized as a move in the wrong direction; the move, being forced, was made but the magnitude was consciously limited.[4]

The point of the matter is that correcting forecast imbalances in strategic forces by further increasing unstable forces creates a dynamic from which there may be no escape. The upward vector, toward the most critically unstable region, is a direct product of this dynamic. It is imperative that the process be reversed. In fact, it has long been an objective of advocates of arms control to reverse this direction and proceed downward along the diagonal.

President Reagan's proposal to introduce an "active" form of strategic defense has been offered to influence the trend. The effect of such a defense is shown on Chart 11. If an active defense were deployed by the United States, the result would be a left vector the length of which would be determined by the effectiveness of the defense.

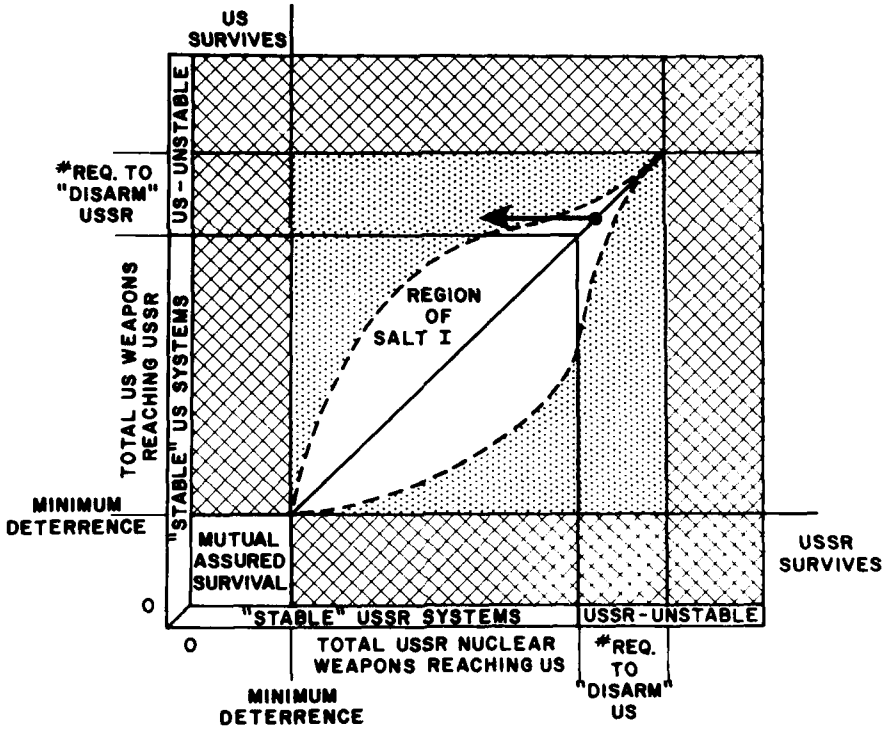


Chart 11

It is a left vector which essentially reduces the number of Soviet weapons which can reach the United States (the X-Axis). As displayed in Chart 11, it is possible for an effective defense to move one into an unstable region and, in the case of SDI, in favor of the United States. Thus it is possible for the SDI to be destabilizing and seen as an attempt for the United States to gain superiority, both contrary to President Reagan's stated intentions of

maintaining stability and a balance. However, since our basic concept deals essentially in vector calculus, there is an available collateral move by the United States to return to the diagonal.

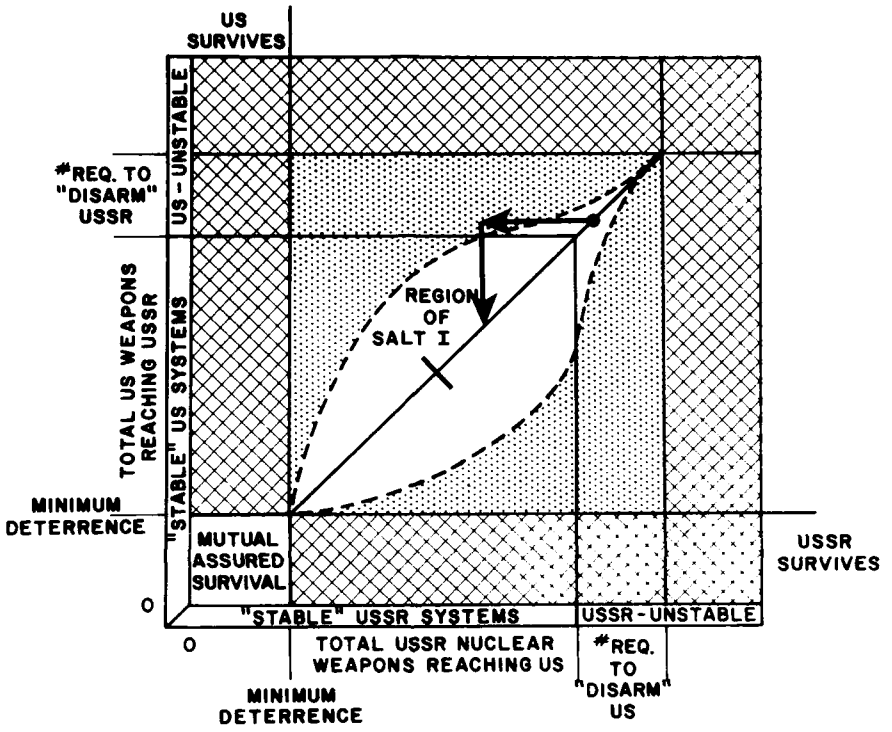


Chart 12

Chart 12 shows a downward vector, added to the previous vector from Chart 11. This produces a resultant vector along the diagonal and reverses the perilous direction described previously. The additional vector is created by reducing the "number of U.S. weapons reaching the U.S.S.R.," in other words, the "Y" axis. In descriptive terms this means that if an SDI is deployed, balance and stability can be achieved, *within a wider region of stability,* by a corresponding reduction in offensive retaliatory forces.

But, does this make military sense? It may be if the rationale for possessing additional weapons, in the region between SALT I and the "disarming" level, is "insurance" against the use or lose dilemma. If so, then additional forces have been produced to correct forecast decays in retaliatory response curves. Given an alternative method of providing insurance (defense), the rationale for one's own offensive insurance forces is reduced in proportion to the degree of effectiveness of SDI. In this case the increased defense and decreased offense combination makes sense.

Therefore, while critics of SDI correctly point to the destabilizing and unbalancing aspects of the program, there is a logical and militarily sound collateral move that would return both stability and balance to the situation; and at a position within the model which is less sensitive to imbalance. [Throughout this report it is assumed that "reduction" in offensive forces equates to reduction of the *correct* offensive forces. While outside the SALT I region, reduction of prompt counterforce weapons is in order. It would be foolish to keep unstable weapons while reducing the SALT I region.]

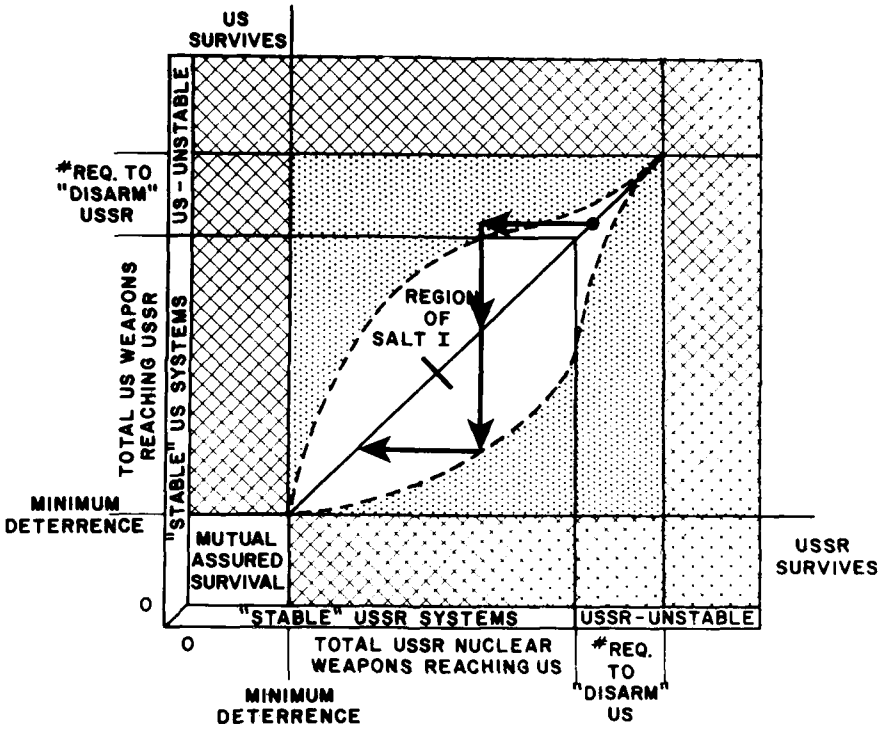


Chart 13

Thus far the only vectors considered have been for U.S. actions. In other words, the United States could, unilaterally, maintain stability if the Soviets take no action. But what would happen to the relationship if the Soviets were to take parallel actions? As shown in Chart 13, if the Soviets also combine defense with offensive force reductions, the sum of U.S. and Soviet moves is further along the diagonal and at a more rapid pace. There is no apparent contradiction of the objectives of stability and balance when both superpowers possess strategic defense, if the corresponding offensive force reductions are made. It does, however, raise an interesting question of how far to proceed because, at some point, the "open area" begins to contract—

much as approaching the upper right-hand corner. [We will return to this issue after we examine a few more combinations.]

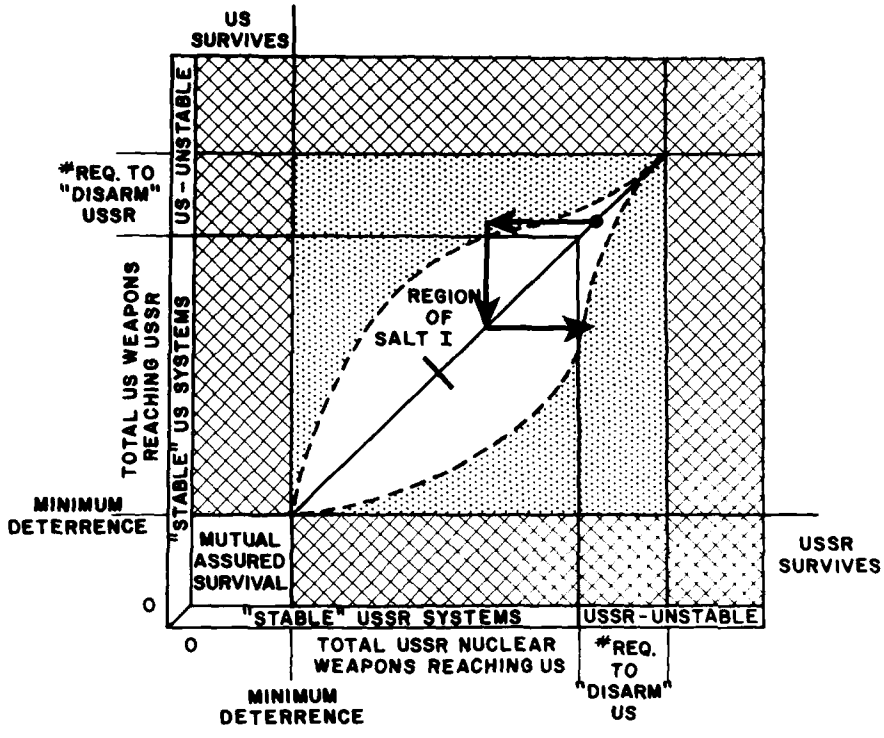


Chart 14

Now, what if the Soviets do not respond in this manner? Chart 14 is illustrative of a Soviet increase in *offensive* forces in response to the U.S. defense-offense shift. As before, the length of the vector is determined by the effectiveness of the offensive forces added—in this case reentering the unstable region to the advantage of the U.S.S.R. However, to be destabilizing the offensive vector has to be of a greater magnitude than in the original position because the distance between the diagonal and the unstable region is increased.

But at some point, the United States would have two choices, as portrayed in Chart 15. Path "A" would represent countering the Soviet offensive addition with added U.S. defense. Path "B" would mean matching the Soviet increased offense with U.S. offense. The decision of which path to pursue would rest on whether or not the U.S. defense could outpace the Soviet offense on economic, technical or other grounds. It is clear, however, the path "A" could result in a progression of vacillations which, while consuming resources on both sides, accomplishes little movement down the diagonal. Further, this vacillation would increase the reliance on defense by the United

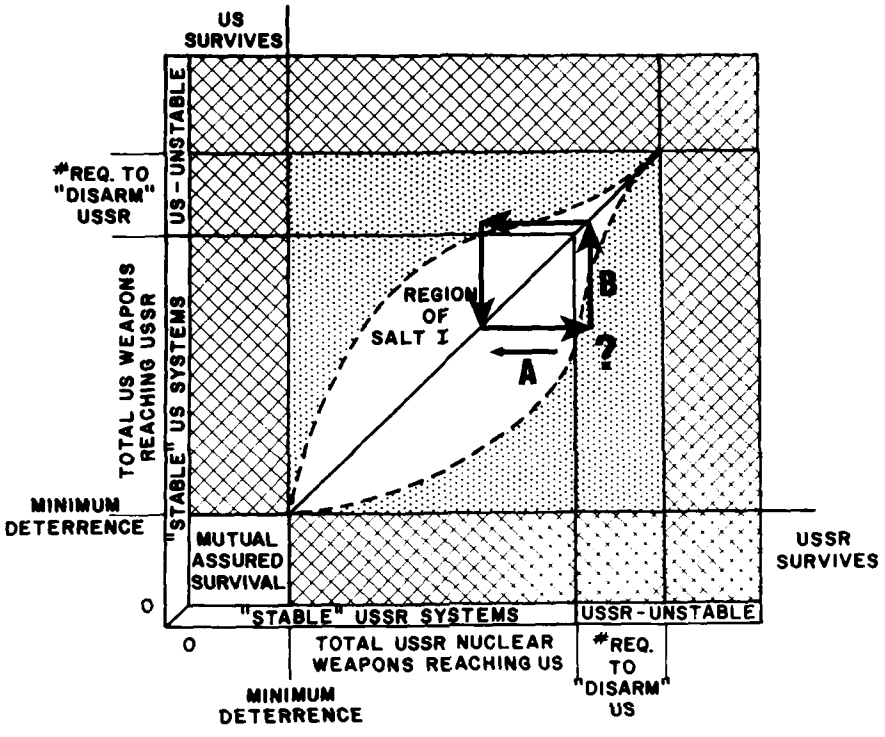


Chart 15

States, hence making such factors as defensive system survivability/reliability more important, because the overall balanced position is subject to an underlying imbalance in offense.

On the other hand, path "B," although probably not iterative, has the net effect of returning to the initial position by walking in a square. Thus, having spent a great deal of money, the "B" situation would be essentially the same as when we started; hardly a wise way to expend scarce national resources. This has been a point frequently made by SDI critics. Yet, their argument that SDI should not be pursued is incorrect. We must examine the single variable which offers an opportunity to free ourselves from the existing nuclear dilemma—the offense-defense relationship. If the defense can outpace the offense, then the offensive loses its validity and probably precludes path "B."

The finding from our analysis so far, then, is not to abandon SDI, but to establish design criteria which would eliminate the "B" possibility described in Chart 15. If SDI architectures cannot be created which allow defense to well outpace offensive changes, then it should not be deployed; if a leveraged defense concept can be deployed, then do so, but accompany it with balancing steps already described. Further, there should be little doubt at this point that offensive constraints facilitate defensive introduction.

This writer has sought to make the point that the series of steps required to march along the "diagonal path" is congruent with the objectives of arms negotiations. Arms control advocates stress the importance of a downward momentum along this path, a sense and direction which has eluded the negotiators. SDI at least offers the *possibility* of achieving the desired goal, which is an observation not generally recognized or even considered by the critics. It should be similarly obvious that movement along the diagonal path could be done independent of an SDI. That is, movement along the diagonal does not depend on SDI; it could be done through the negotiation process alone or by other combinations of added defense and offensive reductions. However, in order to begin the downward diagonal movement, something is needed to reverse the present upward movement (see Chart 10).

Arms negotiations (SALT I and SALT II in particular) have failed miserably to accomplish this reversal. Specifically, both parties built out of the region of SALT I during the period of detente, as this action was not prohibited nor even addressed, in the seminal agreement. Unstable weapons seem to have a great utility in providing increased deterrence, possibly because of the counterforce equals countervalue assumption, but certainly because of their relative costs and extreme accuracies. It just may not be possible to reverse the present trend toward the most unstable region until the utility of these unstable weapons (presently ballistic missiles) is driven toward zero. Although SDI is not the only technique that could be employed to deal with these destabilizing weapons, the President's guidance to focus SDI research first on defense against ballistic missiles is logical in the context of returning "feasibility" to the negotiations process.

In this context, it may not be necessary to employ SDI to accomplish anything except the reversal of the present trend; arms negotiation theory is valid once the SALT I region is reentered and could certainly be used to accomplish the remainder of the movement. If pursued correctly, SDI can be seen as a parallel and complementary effort to the negotiation process; at any rate, SDI and arms negotiations are not automatically in opposition as asserted by many critics.

Of additional interest concerning the relationship between arms control and the SDI, it has generally been assumed that greater numbers of weapons make the arms control process less sensitive to verification, and some believe we need improved verification techniques to achieve arms reductions. As pointed out by Secretary Weinberger in a speech delivered on his behalf in Bonn, SDI could alleviate concerns over verification in proportion to the effectiveness of the system. Applied to this model, it would constitute expanding the stable zone about the axis of a balance.

But this raises the question of the time interval between SDI research and a deployment decision. What incentives do the Soviets, or the United States, have to reduce offensive arms with the SDI looming on the horizon as an unknown? SDI critics point out that the Soviets, in fear of a U.S. SDI, would begin

immediately to increase offensive forces to lead U.S. SDI deployment. The same logic applies should the United States perceive a Soviet ABM breakout. These possibilities may be illustrated:

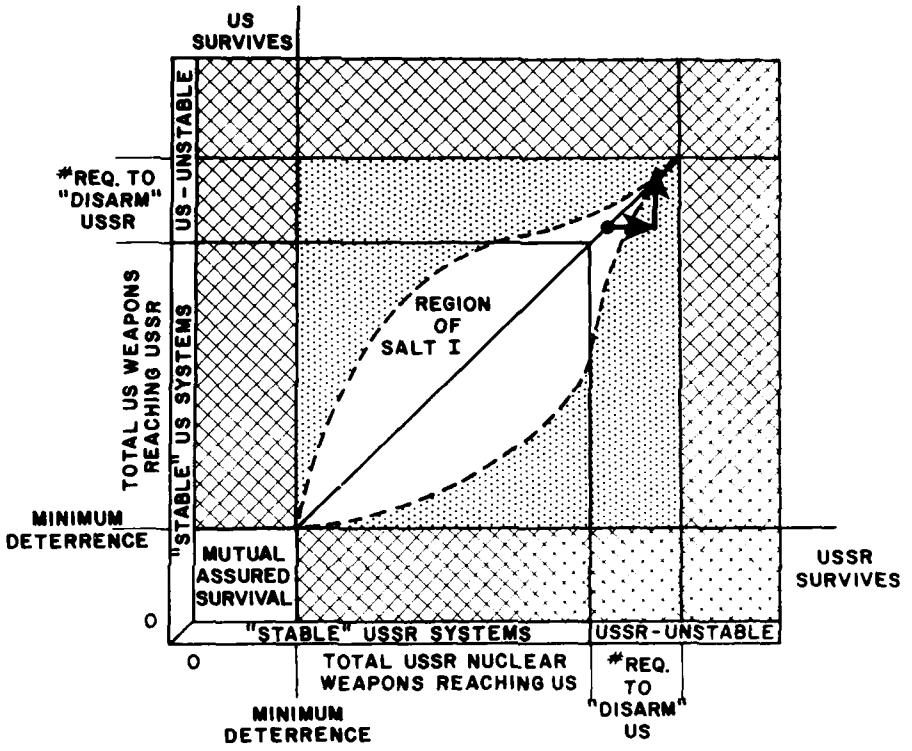


Chart 16

A. (Chart 16) The Soviets, in anticipation of a U.S. defensive vector, increase offensive forces, dictating an immediate increase in U.S. offensive forces. Now, the situation is further unstable, with no defensive moves having been made, and the path is *opposite* to the objectives of arms control. Further, there is considerably less "open area" for maneuver of the offensive-defensive combinations and any such combinations must pass through the starting position before achieving the possibilities offered in Chart 12. This arrangement is thus analogous to Chart 15, except the path passes through a more restricted stable area.

B. (Chart 17) The Soviets, in anticipation of a U.S. defensive vector, increase offensive forces and the United States responds with counter-balancing defensive forces. In this case, the upward diagonal movement is arrested, but any downward diagonal movement is dampened by further Soviet offensive increases. [This scenario assumes a favorable offense-defense improvement ratio.]

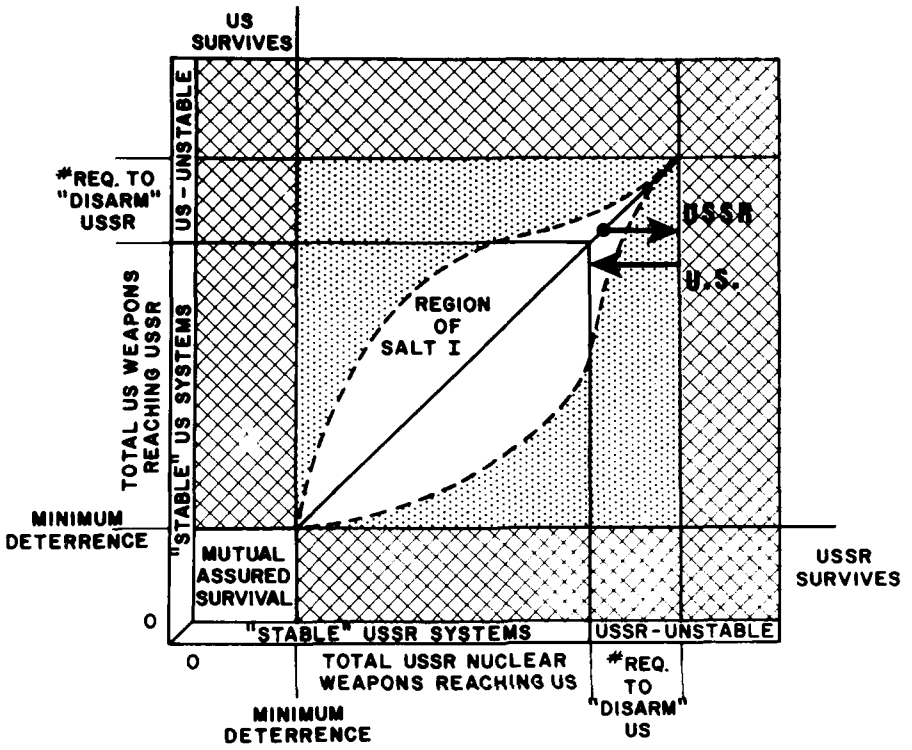


Chart 17

At this point it is tempting, but I assert not prudent, to assign probabilities of occurrence to these combinations as a decision tool. We simply cannot judge their relative likelihoods.[5] Indeed, it is not even wise to make the common analytical assumption that these are equally likely possibilities because they are not equally probable; we just do not know how they differ. About all that *can* be said is that each of them is possible and that each has certain positive and negative factors which bear on the problem. It would be logical, then, to examine these characteristics to determine if the negative possibilities can be eliminated or if the positive aspects can be magnified. Said in another manner, are there mechanisms to *constrain* adverse movements (up-right) or provide incentives for more favorable actions (down-left)?

The stimulus for adverse action (generally defined as increased offensive forces) seems to be perception of actual or impending upset of the balance by introduction of defenses. In other words, one party might perceive the other would introduce defense, yet not make the corresp ding (offsetting) offensive reduction; this is an especially legitimate concern as one approaches the regions of crisis instability. If the party making the defensive improvement honestly intended to reduce offensive forces, a dampening of apprehensions might be achieved by reducing offensive forces first—then

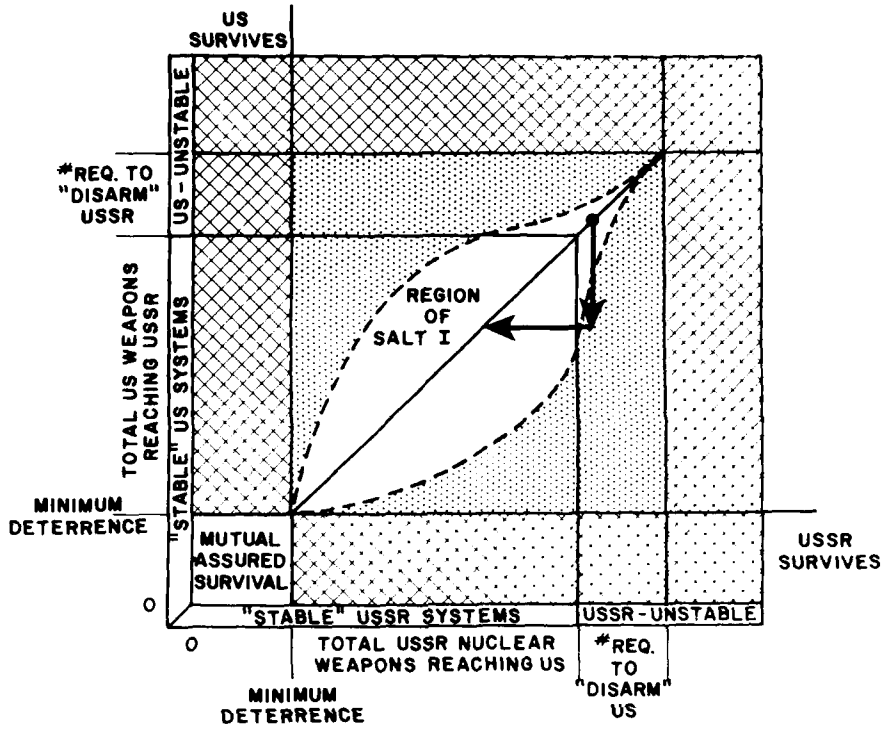


Chart 18

adding defense. There is an element of risk associated with this approach because the actual defense effectiveness might be largely unknown and offensive reduction has the initial effect of moving into the zone of instability favoring the adversary (see Chart 18).[6] As risk management is a central feature in the strategic nuclear arena, this latter combination nearly demands that such moves be small in magnitude, probably easily recoverable and certainly not last over a long period of time, unless further favorable events follow. In more simple terms, the sequence of "reduce then defend" probably cannot be reasonably contemplated unless the reduction is small, thus making the corresponding defense a limited one. Such a combination can scarcely be expected in conjunction with an extensive defense.

A corollary to this argument is that such moves would be better received or perceived if they were discussed in advance. One might almost go so far as to say the "risk" associated with such an approach would be entirely inappropriate unless there was some confidence that the other party understood the significance of the move well ahead of time. This is not to conclude that such a series of moves would depend on permission from the other party, only to point out that risk is only worthwhile when there is a chance of success—and negotiation might add to the probability of success.

Another corollary is that the offense reduction, defense increase sequence clearly is more viable if the other side's offense increases are constrained. *If* offense increases are constrained, the impact of the possibilities derived in Charts 16 and 17 is reduced. What incentives, then, can be provided to achieve the offensive limitations in the face of potential (and uncertain) increases in defense? That may be the question of the century, but the answer seems to be based, once again, on accepting a mild, temporary offensive imbalance (on the part of the potential defender) which is, in turn, predicated on only modestly effective defenses and clear communication of intent.

The argument then comes back to the same point. The probability of success clearly is increased in a constrained offensive environment. In order for the potential defender to create this environment, he probably should construct incentives for cooperative behavior and/or restrictions against adverse behavior. The linchpin seems to be a unilateral step to reduce offensive arms before increasing defense. But, given the risk associated with this concept, the reduction must be small, and, again, it must be a reduction of the correct type of offensive forces (i.e., prompt counterforce weapons). Given the importance of clear reception of the signal, it seems prudent to communicate through the negotiation process.

But this raises a larger question. If a party can perform a unilateral reduction, and accept the associated risk for a period of time, and that process is coordinated through negotiation, what, then, is the need for defense? Why not use the same process to achieve sequential reductions? Or, if the reader is prepared to answer that the negotiation process has failed to accomplish reductions in the past, what then causes the reader to have any faith that a constrained offensive arms environment can be created to allow the defensive moves to be productive?

The seemingly obvious answer is to use the negotiation process to dampen apprehensions about the possible destabilizing aspects of strategic defense on the part of both parties. In short, if offsetting offensive reductions are contemplated to maintain a balance and increase stability, this intention should be made explicit as research proceeds. There is ample time to discuss the issue and considerable drawback to keeping these sorts of intentions concealed; uncertainty elicits response with known and effective offensive systems and this would translate into increased offensive forces. Further, SALT I requires discussion if abrogation of the ABM accords is contemplated, and either party moving to strategic defense certainly constitutes abrogation of at least the intent, if not the letter, of the agreement.

A more philosophical answer probably lies in President Reagan's 23 March speech and in the more recent writings of Schell and Dyson. They hold out the prospect of a defense dominant national security environment in lieu of the present condition where offense dominates. Simple reduction of offensive weapons will not change the basic construct of the environment—the offense

will still be supreme. *Only* by the introduction of defense can we hope to achieve the situation where nations can defend, but cannot successfully attack—a situation which is generally conceded to be at least as safe as today. The larger questions, then, are how to get from here to there, and what else is affected.

Notes

1. A rational argument can be made that there is already a great deal of uncertainty in a counterforce strike. Such factors as polar flight and nuclear weapons effects certainly introduce major "uncertainties." While these arguments are considered valid, one must still question why both superpowers are pursuing a *capability* of prompt hard target kill unless their intent is its use. Thus, for the purpose of this paper, it is concluded that the physical factors do not dominate the problem; instead, the dominant aspect of "uncertainty" will be those items which are controlled by the other party and are, thus, likely to be unknown to the attacker.

2. A "balanced" position also reflects long-standing U.S. objectives. In preparation for SALT I, the Nixon administration, under the guidance of Dr. Kissinger (then the Assistant for National Security Affairs) conducted an interagency review to establish whether "superiority" or "balance" within the nuclear arena was an appropriate objective for the United States. The report concluded that even if desirable, continued superiority was not possible, given the observed Soviet nuclear buildup; therefore, the United States should seek a position of "sufficiency" of strategic forces to accomplish our objectives. This report is paraphrased in *International Arms Control: Issues and Agreements*, (Stanford Arms Control Group, 1984) as:

> First, US strategic forces must discharge their basic deterrent mission. That is, they should be able, even after an initial attack, to retaliate by wreaking an unacceptable level of damage on the attacker. *Second, the structure and survivability of the forces must be such that a first strike would not offer an attacker any military advantage, thus ensuring 'crisis stability.'* Third, without seeking to exactly match opposing forces, the US should deploy strategic forces whose size and capabilities are not, and do not appear to be inferior to those of the opposing forces. This concept which can be labeled 'essential equivalence' had the political purpose of reassuring the US public and Congress as well as America's allies and clients. Fourth, strategic defenses including ABM (unless otherwise limited by an acceptable agreement), should be able to protect the United States against small or accidental attacks and should contribute to the survivability of the deterrent ICBM forces. . . . (Underling added)

3. Given the spectrum of systems available, there is probably little or no chance this upper right-hand area will *actually* be achieved. However, the avoidance mechanism will probably be proliferation, thus pushing the "box" further away, possibly with ever increasing velocity.

4. The value of land based ballistic missiles, beyond economic factors, has long been touted as their ability for prompt retaliation and penetration capability. However, if their contribution to Flexible Response is limited to countervalue targets, "prompt" retaliation has little meaning. This could cause a planner to contemplate reversing the ICBM role to one of a Reserve force—exploiting the connectivity/retargeting advantages of the more modern ICBM's. Such change in role might be possible if these forces had high survivability, as associated with an inexhaustible preferential defense and/or superhardening. This might also answer many critics objections that the "prompt" feature of the ICBM's is valuable only *because* they are vulnerable. The more recent ICBM characteristic of "prompt counterforce" is also being critiqued. The scenario generally posed here is a Soviet strike on U.S. missile fields, a U.S. launch under attack then the Soviets launching the remaining forces before U.S. ICBM's arrive; thus the U.S. "prompt counterforce" retaliation does not perform damage limitation, but is useful for a first strike. Switching the ICBM's to a Reserve role might alleviate this perception as well.

5. Even this list is not intended to be exhaustive, but it should be sufficiently illustrative to conclude this portion of the analysis.

6. Clearly, the reduction in weapons must be of the proper type (unstable weapons), because reduction of stable weapons simply reduces the zone of SALT I, which shifts, but does not diminish, the trend toward instability. Additionally, the magnitude of the reduction is difficult to calculate because effectiveness of the defense will be largely unknown to both the defender and the attacker.

IV
Related Issues

This chapter takes several issues which have come up in my discussions with other analysts, defense officials or others and imposes them on the "model," where possible.

Active defense, we have discovered, can reverse the direction of movement in the strategic nuclear model, away from converging zones of instability. So can negotiated reductions in offensive forces of the counterforce type. But, regardless of the method of movement along the diagonal path, there is still the question of how far along this diagonal toward the origin should the path be pursued? At least two factors come into play: first, because of the geometry of the unstable regions within the zone of SALT I, passing beyond the midpoint would again place the actors in the unstable regions (concavity of the curve, derived with Chart 9); and, second, approaching the area of Mutual Assured Survival (MAS) should only be contemplated with great caution because, having entered that area, the premise of deterrence is violated.

In the MAS area, the speculation arises that nuclear weapons have been eliminated and the world is now safe for conventional war, or that nuclear war is now "thinkable." These issues combine to raise real concerns of proceeding beyond the midpoint of the SALT I region, unless the basis for the model can be changed. The basis for the model, in fact for superpower relations, is that: (1) superpower relations must be based upon mutual fear, and (2) that nuclear weapons are the instrument to create that condition of fear. Both conditions are the product of history and can be changed. In fact, changing the relationship from mutual fear to mutual comfort would undoubtedly be a better world; it is just that we have not yet been able to envision the path to that condition.

Taking the second condition first—changing the basis for retaliation to something other than nuclear weapons—that may be technically possible, especially if the mechanism for deterrence is denial of objectives through offensive counterforce. Emerging technologies are being evaluated in NATO which would replace Intermediate Nuclear Forces; these technologies are "smart bombs," hard structure munitions and sophisticated fuzing techniques which allow an extremely accurate placement of an advanced conventional munition. They may well achieve target damage levels approaching that of

small nuclear weapons, but without the collateral damage or residual effects. It is feasible that these technologies could be applied to the strategic weapon arsenal. If this is possible, the zone of MAS could be penetrated by replacing the nuclear retaliatory capability with these advanced conventional munitions. What we would have done is to retain "fear" as the basis of the relationship, but changed the instrument of instilling fear.

The first issue, changing superpower relations from mutual fear to mutual comfort has been an optimistic but elusive goal. However, moving from the current position to the point where passing the midpoint of the SALT I region can even be contemplated is probably going to represent a long, intricate series of moves and countermoves, over an extended period of time. Any successful reversal of the current trend and subsequent downward movement along the diagonal will undoubtedly require extensive coordination and some cooperation between the United States and U.S.S.R., whether or not SDI is deployed. Having reached the midpoint, some atmosphere of mutual trust, or less apprehension, could surface and press national leaders to reduce further the atmosphere of fear. If the present trend continues, this situation will be out of the question; at the very least SDI offers a catalyst for reversal and a chance to ask the question. Incorporated with the negotiation process, it could further stimulate movement toward a more stable relationship at a lower level of forces.

Still, in a world of deterrence based on either assured punishment or denial, one must contemplate whether removing the nuclear threat would now make the world safe for conventional war. As the first possessor of nuclear weapons, the United States was able to maintain deterrence through strategic nuclear superiority and conventional inferiority (Massive Retaliation). However, as the Soviets built their own weapons the United States adopted strategic flexible response and increased battlefield nuclear weapons. Still, conventional inferiority could be accepted because escalation linkage to superior forces was possible. As the Soviets continued to build, the United States insisted that NATO change the strategy to a similar flexible response for the INF and a commitment for increased conventional forces.

But, in the present state of affairs, the option for U.S./NATO escalation superiority simply does not exist, bringing into question the viability of an escalation strategy. If the escalation linkage is no longer relevant because there is no superior rung available to the United States, then conventional war may no longer be deterred by threat of nuclear escalation in the first place. In this argument, in the context of our model, SDI, then, is not a determinant in whether or not conventional war is more likely. The relative likelihood of nuclear deterrence to conventional war is a function of displacement from the diagonal; this is not determined by SDI but is solely a function of a political decision to retain a balance of retaliatory capability.

This leads to a consideration of whether or not the SDI, in the protection of forces or general territory, would "decouple" the United States from European NATO. To determine this would require a semi-infinite number of examinations, trading off a U.S.-SDI, Soviet-SDI, U.S.-Soviet-SDI, with varying architectures protecting, fully or partially, weapons and/or populations, either covering or not covering Europe and accompanied, or not accompanied with various types of offensive reductions or introduction of new weapons. Having examined most of these, I have satisfied myself that the crucial variables concerning "coupling" are: (1) whether or not Europe has a defense similar to that of the United States; and, (2) the conventional force balance. In making this determination, I am assuming that defense introduction, by either the United States or Soviets is accompanied by compensating offensive reductions—otherwise the "balance" will be maintained by some other sort of unilateral action.

As a matter of consideration, there is a considerable technical debate concerning the feasibility of a U.S. territorial defense which might not cover Europe or other parts of the world. This seems unlikely because effective territorial defense appears to depend on nonpreferential defense (usually boost-phase intercept) which, by definition, would be indiscriminate of the weapons destination, thus protecting all regions of the globe rather than solely the United States. Still, a prudent European would want to participate in both the policy and technical aspects of SDI research in order to preclude what is now considered "impossible."

The conventional force balance becomes extremely important to NATO security, regardless of whether or not a U.S.-SDI covers Europe, as U.S. strategic forces approach the "minimum deterrence" level of our model. In this case, Europe could conceivably become a contained nuclear battleground, or, at the extreme, be subject to a major conventional battle now undeterred by nuclear weapons. The prospect of this could easily decouple European allies from the United States and cause the Finlandization of Europe, thus accomplishing a long-term objective of the Soviet Union. Such an occurrence would be devastating to U.S. interests and the global coalition strategy the United States maintains to contain Soviet expansion. This possibility almost demands the United States investigate European defense along with U.S. defense in the SDI research program—most likely through the antitactical-ballistic-missile (ATBM) concept. It also demands, at some point, that NATO redress the often discussed conventional force in balance.

Redressing the conventional imbalance, however, appears to be an important issue almost regardless of the status of nuclear forces. Former Secretary of Defense, Robert S. McNamara, in two Foreign Affairs' articles, repeatedly draws the conclusion that nuclear weapons, in today's environment are of no use except to deter their use against you—in other words, fundamental deterrence. McNamara's school of thought clearly establishes

conventional force strength as the key to security in NATO which is the absolute converse of the present arrangement. No matter what the reader may think of McNamara's agreement, and many scholars disagree with him completely, the gradual reduction or elimination of nuclear weapons will cause the arguments he presents to surface. Further, the arguments take on a completely different flavor as a function of whether the reduction (proceeding downward along the diagonal) is done with or without defense.

If the downward-diagonal movement is accomplished *without* defense the following situations emerge. First, at some point all other nuclear weapon powers achieve coequal status with the United States and U.S.S.R. While this may be no particular problem, history provides no precedence for dominant powers granting such equality to lesser powers; there is, therefore, a question of political feasibility concerning this level of reduction. Second, or perhaps even simultaneous with the first issue, verification is raised as a dominant issue. As referred to earlier, large numbers of weapons somewhat ease sensitivities to verification—lower numbers cause the issue to be paramount. Third, and probably late in the process, there will be a great incentive for non-nuclear weapon states to acquire these weapons. With the present large inventories, there is little incentive to proliferate—with the major powers now having few weapons, and being "defenseless" the incentive may be overwhelming. On the case of the more radical states, this presents a particularly dangerous world situation.

However, if the downward-diagonal movement is accomplished *with defense*, these issues are shaped differently. First, and probably rather early in the process, other nuclear weapons states are *negated* as nuclear powers. Although this may be a problem for the NATO Alliance, it may be more manageable than the coequal status issue. Second, even at extremely low levels of nuclear weapons, the importance of verification is diminished in proportion to the degree of defense present. Third, any apprehension about proliferation is reduced—even beyond what exists today. In my opinion, these arguments, alone, may make the case for at least limited levels of defense. But, I do not conclude that these arguments establish an overriding case for the more inclusive environment where defenses dominate. That demands further examination and will be addressed in coming chapters.

A reader may be wanting to examine whether, or at what point, a movement to defense could be "terminated," assuming that it is not desired. The answer probably lies in the logic developed during SALT I. Here, both parties agreed to the principle of balance, and to the fact that the balance was to be verified by National Technical Means (NTM). Those activities or systems which could be verified by NTM could be negotiated and limited; those which could only be monitored by other intelligence sources would not be limited. Instead, it was up to each party, independently, to pursue a balance in these areas.

Research is a specific area which can only be monitored, versus verified. Thus to be balanced either no party is performing research in new defensive technologies or, both sides *must* in order to buffer a destabilizing "breakout." Given that the Soviets are performing research in this area, as is the United States, both sides must continue or both sides must cease. But for both sides to cease implies verification through NTM, which for research is impossible. Therefore, research must continue to prevent the third case, breakout, from occurring. Further, this research must seek to determine how an SDI might work as well as how it could be countered—both vital elements, as discussed before, in calculating the offense-defense relationship essential for a deployment decision.

It would seem obvious that research into SDI is going to continue and that any deployment decision, contemplated or actual, will significantly influence national security matters well beyond that of the strategic nuclear environment. Critics and advocates alike seem, at this stage of the open debate, to have been far too narrow in their arguments. While the critics have concluded that SDI will be destabilizing, decoupling, destroy hopes for arms control, fuel the arms race, etc., their arguments need to be modified by substituting *could* for *will*. On the other hand, the advocates' stance that SDI will increase deterrence, support stability, etc., needs to be tempered similarly by *could* and to have a follow-on question of *how*? A later chapter will provide more detailed analysis of several of these issues.

V
Treatment of Implementation Factors

Here a crude "pert-type" diagram is developed as a demonstration of how national strategy, R&D, and deployment might be melded into a decision process.

Although we have a general idea of how a "balance" position on the diagonal could be maintained, it would be impractical not to extend the discussion to determine how to direct Research and Development resources toward initial deployment. The maintenance of a stable mutual and extended form of deterrence is the objective to be kept in mind. Our discussion will center on the SDI deployment decision relative to stability through injecting active defense (counterforce) into the relationship. In general, the debate on crisis stability centers on whether or not strategic defense would create a situation where one party could perform a counterforce first strike and then blunt a "ragged retaliatory response."

A review of current SDI proposals reveals there are four general categories of strategic defense being contemplated:

Treaty Constrained Preferential Defense. This is a point defense of one site and constrained to being able to handle a limited attack. The Homing Overlay technology would meet treaty constraints. If new technologies were employed such as land-based directed energy weapons (DEW), or advanced kinetic energy weapons (KEW), some modification of the ABM Treaty probably would be necessary. The purpose of this subcategory is to preserve the intent of the Treaty.

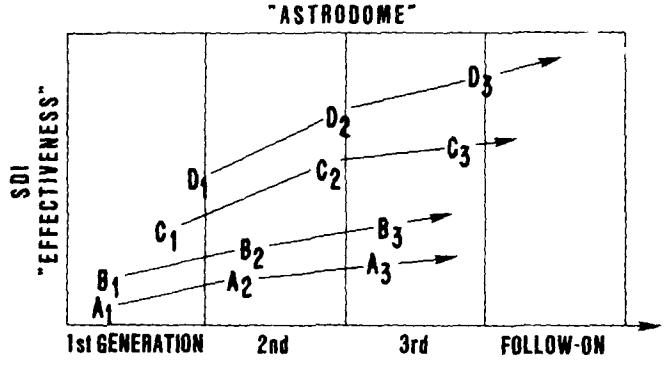
Expanded Preferential Defense. Using the same technology as listed above, the area covered is expanded to provide some semblance of territorial defense. This would violate the ABM Treaty. Most open literature indicates this could be accomplished with endoatmospheric KEW or DEW systems.

Quasi-Preferential Defense. Using some sort of KEW or DEW kill mechanism for midcourse intercept, a wider area is defended. Depending on where the intercept is contemplated, this sort of defense can be preferential (i.e., warhead destination is known) or nonpreferential (warhead kill is accomplished before warhead destination is calculated). Most experts agree

this requires at least a space-based sensor system coupled with either a space-based or rapid pop-up kill mechanism.

Nonpreferential Defense. The general scheme for wide area protection is boost-phase intercept from rapid reaction, space-based systems. In this case target destination is not known. Most analysts agree that this method provides the largest defensive leverage because a single booster kill eliminates several warheads and accompanying decoys.

Nearly all proposals speak of a layered approach to strategic defense in the final states of deployment. The layers would be *boost-phase*, accomplishing a great deal of filtering; *midcourse*, focused on high-value areas; and finally, *point defense* of critical targets. Although a fully deployed system could encompass all of these concepts, it is our objective to determine if there is a preferred order of employment which might facilitate "walking the diagonal" in the previous model.



PATH: DESCRIPTION

- A : TREATY CONSTRAINED
- B : NEAR TERM TECHNOLOGY (POINT DEFENSE)
- C : SPACE WEAPONS, MIDCOURSE INTERCEPT
- D : UNCONSTRAINED, BOOST INTERCEPT

FORCE DEFENSE

CITY DEFENSE	ZERO	LOW	HIGH
ZERO	0,0	0,1	0,2
LOW	1,0	1,1	1,2
HIGH	2,0	2,1	2,2

Chart 19

Chart 19 shows the relative effectiveness which might be obtained if each of the four options for defense were pursued independently. Path "A" represents option "A" and "B" option "B," etc. Improvements are plotted according to technical generations or improvements in the concept. Although this chart is clearly a rough approximation, the relationship between the paths is worth evaluation. First, path "A" is available rather early, but will not lead to a significant increase in the overall "effec-

tiveness" of strategic defense. It is simply too limited. Path "B," although it will achieve greater effectiveness eventually, is still limited by being a point defense. Path "B" may be more limited by economic factors than by technical ones. The first generation version of path "C" would certainly be available later than either "A" or "B"; however, at each step, its effectiveness is higher than almost any version of the point defense. Nevertheless, filtering by a midcourse system would decrease the stress on a point defense thus providing a synergism if A, B or C were combined. Still, path "C" does not approach the "Astrodome" level of defense. Path "D," most likely based on boost-phase intercept, would be a considerable time period away; but, once deployed, its effectiveness could approach the 100 percent level of defense against ballistic missiles.

Although these paths will be evaluated independently, the reader should be aware that a decision could be made to move from point A-1, B-2 to C-3 as long as the research and development indicates feasibility. Our purpose is to see what points might logically be excluded for reasons of maintaining stability. Questions of costs and other criteria applying to such a decision are not here addressed, only stability. In order to accomplish this, Chart 19 provides a matrix in the lower right-hand corner with the variables of zero, low and high defense of cities and forces respectively. Force defense, or point defense, is generally a preferential defense; while city, or territorial defense, is nonpreferential. The present position is zero defense of both (element (0,0)). The desired end position, according to the President, is element (2,2).

It should be emphasized that this particular portion of the analysis concerns ballistic missile defense. However, a similar analysis could be taken for other types of defense, such as against cruise missiles or aircraft, assuming the methods of defense could be partitioned into preferential and nonpreferential modes. As is often pointed out by critics of strategic defense, if the threat from ballistic missiles is negated, there is a strong possibility that the superpowers will switch to other nuclear delivery systems. The object here is to focus first, as the President directed, on the most destabilizing aspect of the situation and to determine if a logical scheme can be developed to change the overall strategic situation. It is proposed that that process involves moving from (0,0) to (2,2) on the matrix.

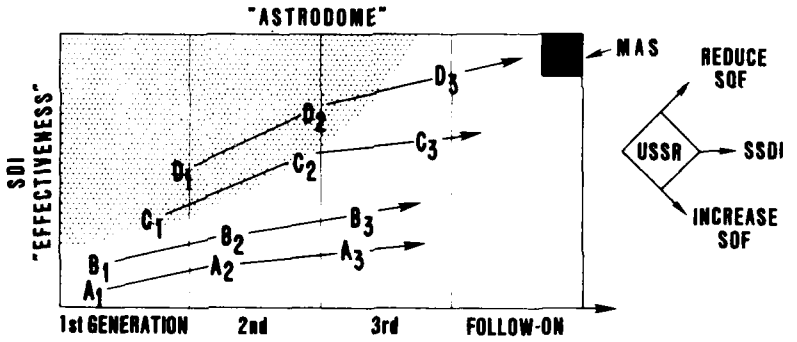
The path between these two cells can be accomplished in several fashions: for instance, by going directly from (0,0) to (1,1) to (2,2); pursuing the boundary from (0,0) to (1,0) to (2,0) to (2,1) to (2,2); or by various combinations in between. We are interested in selecting the path which could offer the greatest stability. Table 1 lists each of these matrix elements and their relative influence on crisis stability.

Table 1 is based on the assumption that the United States does not make a collateral reduction in offensive counterforce capability and present force

levels are not augmented with increasingly destabilizing offensive counterforce weapons. Using these assumptions, there is no path that maintains a balanced version of stability. What we have is stability based on U.S. superiority, even at the objective cell (2,2). This contradicts the President's statements. Therefore, the United States *must* contemplate offensive counterforce reductions, to be consistent with the President's statements, if SDI is to be used to go beyond cell (0,1) using path "A."

However, even a decrease in these types of weapons will not make the (2,0) or (2,1) cells stable or balanced. A reduction in offensive counterforce weapons by the United States in supporting (2,0) or (2,1) would create a situation where the Soviets could disarm the United States and hold U.S. cities hostage to the degree of effectiveness of the SDI. The United States, having provided no alternative "insurance" for its retaliatory forces, cannot sensibly reduce offensive forces in these cells.

Further, cell (1,0) makes no strategic sense. Even in the context presented by Freeman Dyson in *Weapons and Hope* that ". . . since survival may be possible, it makes sense to save lives . . . since survival may be impossible, it makes no sense to count the lives saved. . . ," cell (1,0) is generally considered more difficult to obtain than either (0,1) or (0,2) and, proceeding beyond (1,0) requires the concepts of the earlier available cells. Cell (1,0) is thus rejected because there are better routes to the same objective.



PATH: DESCRIPTION
- A : TREATY CONSTRAINED
- B : NEAR TERM TECHNOLOGY (POINT DEFENSE)
- C : SPACE WEAPONS, MIDCOURSE INTERCEPT
- D : UNCONSTRAINED, BOOST INTERCEPT

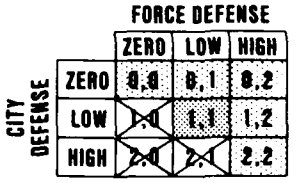


Chart 20

Chart 20 shows the elimination of the less than desirable cells and superimposes a "keep out" area on the implementation chart. A stable path,

the only path remaining from (0,0) to (2,2), is along the border and lightly shaded. This approach indicates that an early deployment decision on point (preferential) defense would be sensible, especially if accompanied by offensive force reductions, and that an increased emphasis on defense of forces could be both balanced and stable.

However, in order to reach the President's goal of (2,2), some research is going to have to be performed in nonpreferential, most likely space-based, mechanisms. Still, deployment of these type systems should be delayed until the force structure is altered to maintain stability. An abrupt shift to nonpreferential systems could upset a critical balance and provoke a Soviet response of the type described in Chart 16. As already discussed, in the absence of proof of a sense of urgency, there is no need to proceed at an alarming pace toward the nonpreferential systems.

Soviet reactions and perceptions are obviously very important. It is postulated that a similar matrix on stability and balance could be created for the Soviet Union, possibly even with identical conclusions. Further, the United States and Soviets could cooperate and speed up the process and each achieve an "astrodome." For instance, if "unstable" systems were eliminated through the negotiation process, there would be little need to deploy a robust defense against a capability that no longer existed. However, a "limited" nonpreferential defense might be contemplated to buffer the verification concerns. This would obviously save both parties significant resources and, quite possibly, build the confidence needed to be able to contemplate passing beyond the midpoint of the SALT I region discussed earlier.

Figure 20, and the previously developed model might also have some applicability to Arms Control. Many specialists agree that arms negotiations have failed to achieve meaningful reductions or a more stable environment because such discussions have focused on creating a balance rather than resolving the "problem" of stability. Negotiation thus degenerated into exercises in "counting" which ignored the central strategic problem—that both sides were proceeding toward zones of critical instability.

The model presented in this paper is based on symmetry. If the United States or the Soviets were asked to redraw the model, both would structure a series of rectangles, rather than squares, each showing the other side at a relative advantage. But, having agreed on the "physics" or "mechanics" of operation within a symmetric model, perhaps negotiators could identify the offending systems and use the principles developed here to resolve the problem. It might be possible to restore a symmetric position if the cause of the asymmetries could be clearly identified.

This, of course, implies that the Soviets are willing to approach the negotiations from a "problem solving" perspective rather than as a competition for relative advantage. The same can be said for the United States. Whether or not this is possible is rather difficult to forecast, but most

complex problem solving does being with some sort of modeling and investigation of how key variables operate within a theoretical and constrained environment. Having discovered how the system should operate, it is often easier to interpret the "real world" and engineer solutions. While this model might not be the approach to unlock the arms negotiation conferences, the technique of dealing in abstractions first might prove useful.

VI
Historical Evolution and Trends

This chapter will display the "model" at some interesting historical points, as well as attempt to describe "reality" from the U.S. perspective, with the objective of predicting how the model will look after the M-X/D-5 deployments. This section is necessary in order to conclude with recommendations on how to begin a shift toward defense-dominance with respect to the already derived dangers.

There can be no question that the United States held a nuclear advantage at least through the late 1950's; for a long time after WW II the United States had the *only* nuclear weapons. Up until the launch of Sputnik, the Soviets simply did not possess a nuclear delivery capability on a par with the United States. Sputnik, however, laid the groundwork for U.S. concern and, eventually, the Missile Gap debate of the 1960 elections. The general argument presented in defense circles was that the Soviets possessed, or might soon possess, sufficient ICBM's to "disarm" the United States because strategic warning was absent, thus bombers (the main retaliatory capability) were quite vulnerable. The "model" may have appeared as in Chart 21.

Even though the United States obviously possessed significantly greater numbers of delivery systems and warheads, the "instability" of Soviet ICBM's, approaching the "disarming" line, prompted a vigorous U.S. response. Recall from the previous chapters that the three general approaches to correct a perceived instability are to: build offensive insurance forces; negotiate the instability away; or, defend the existing forces. In the late 1950s the United States blended the first and last options, undertaking a significant building program which expanded ATLAS, added TITAN I/II and introduced MINUTEMAN as well as replaced the sea based REGULUS with the intercontinental POLARIS. By 1962 each of these "modern" weapons was arriving in the inventories. It also should be mentioned that the manned aircraft capability was being funded heavily, including procurement of the last of the B-52 fleet, research/testing of the XB-70 and initial design of the F(B)-111. On the defensive side, the United States rapidly expanded the Distant Early Warning (DEW) Line system, created the Ballistic Missile Early Warning System (BMEWS), emphasized Nike air defense missiles, and

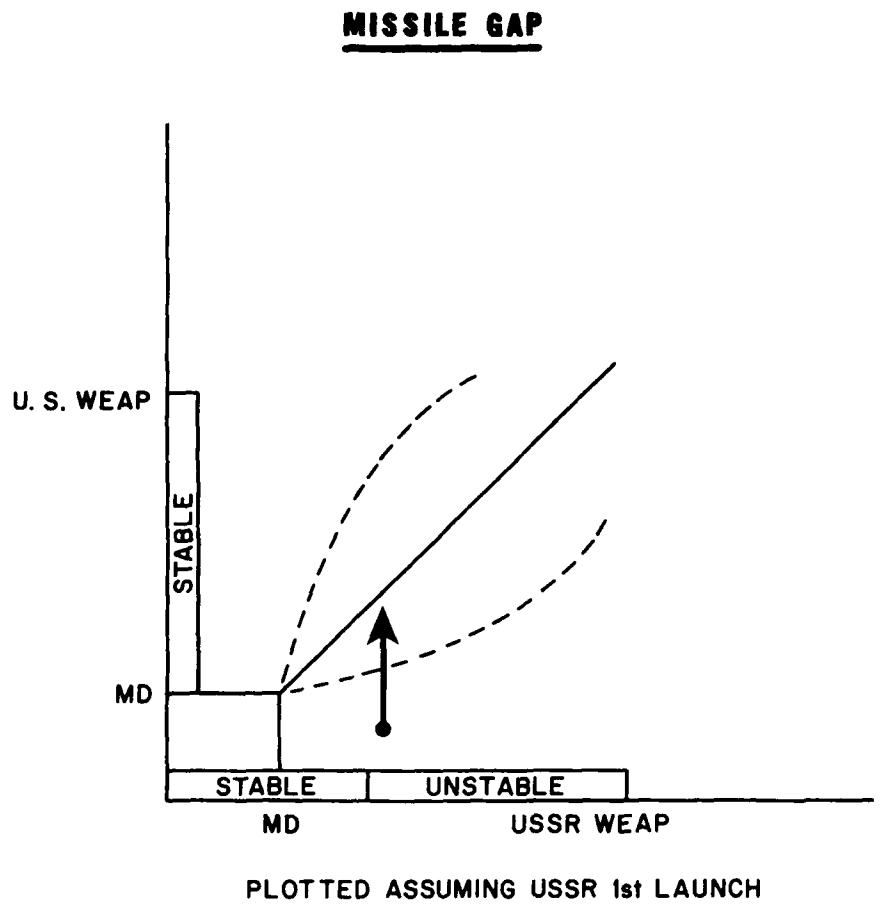


Chart 21

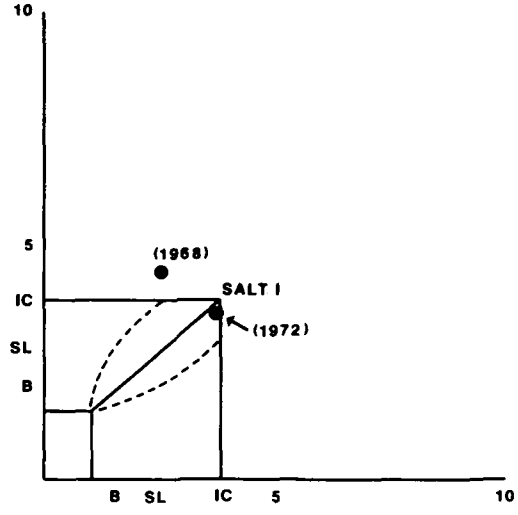
expanded SAC bomber basing concepts for satellite alert/dispersal and created "fast escape" procedures for alert bomber crews.

The response was dramatic, rapid and, many historians assert, excessive to the point of being unwarranted; the basis for the latter argument being a severe intelligence overestimate of Soviet ICBM capabilities. But my point here in displaying this model (Chart 21) is that the estimates were believed and acted upon. When the model approaches the disarming level, whether through false perceptions or not, severe reactions are exhibited.

The model with respect to the period of the SALT I negotiations some 10 years is also interesting. During this period, all weapons were believed to be of the stable variety. Chart 22 plots the SALT I agreed position with the assumption that all ballistic missile launchers had one warhead and that all bombers carried four bombs.[1] The position in 1968 shows a U.S. numeric advantage, in 1972 a Soviet numeric advantage and the SALT I position

POSITIONS ASSOCIATED WITH SALT I

THE INITIAL "ZONE OF SALT I"



	1968		1972		SALT I	
	U.S.	USSR	U.S.	USSR	U.S.	USSR
B	700	350	500	350	N/A	N/A
IC	1050	800	1050	1500	1050	1600
SL	40(650)	40(300)	40(650)	60(700)	44(700)	62(950)

(ROUND TO 50's)

Chart 22

surprisingly equal. (The bomber numbers were obviously a part of the existing strategic situation and hence of the strategic calculations and perceptions even though they were not a part of the specific agreement.)

By the time of SALT II, many weapons characteristics had changed. MIRVed ballistic missiles had been introduced and bombers now carried missiles. Further, the debate over strategic balance had become heavily dependent upon whether French and British systems, or Soviet missiles aimed at Europe or China, were to be included. For the purpose of the next display, only the systems addressed by SALT II will be charted. Chart 23 shows that, once again, the United States had "superiority" prior to the agreement, shifting subsequently to Soviet "superiority," but arriving at a "balance" of forces in the Treaty itself. Although no ironclad conclusions can be drawn from these last two simple figures, it would seem that "agreement" can be reached when the Soviets have achieved at least rough parity in the systems

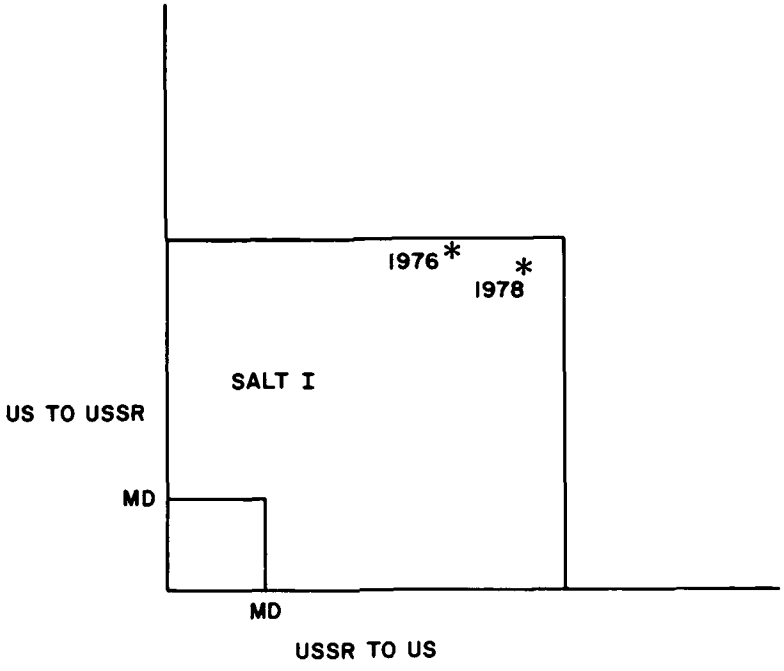


Chart 23

being discussed. This would coincide, somewhat, with more cynical views that the United States has little pressure to agree as long as it is ahead, and great pressure to agree to prevent falling behind, once the Soviets demonstrate the technology. This analysis might also extend to an observation that neither nation will agree to a limit until a perceived "balance" has been (or is about to be) established in force levels—in other words, negotiations are not historically used to create a balance, they are used to maintain it. This may be a significant factor in predicting the course of the arms buildup from this point on.

The U.S. perspective on the present (1986) is shown in Chart 24. The "window of vulnerability" concept stems from the SS-18/19 (approximately 2300 warheads) which could severely degrade U.S. ICBM forces and, possibly, "disarm" command and control connectivity links. As articulated in the open debate, this imbalance has been used to justify the strategic modernization program which includes the M-X, D-5 and B-1. The "model" predicts a rapid and aggressive response to the Soviets approaching the disarming line, somewhat as in the late 1950's. Given the climate of U.S.-Soviet relations in the 1978-82 decision-making period, it is not surprising that the negotiation option was ignored.

But what will the model look like once M-X and D-5, in particular, are in the U.S. inventory? By 1976, the United States had a lead in warheads. By

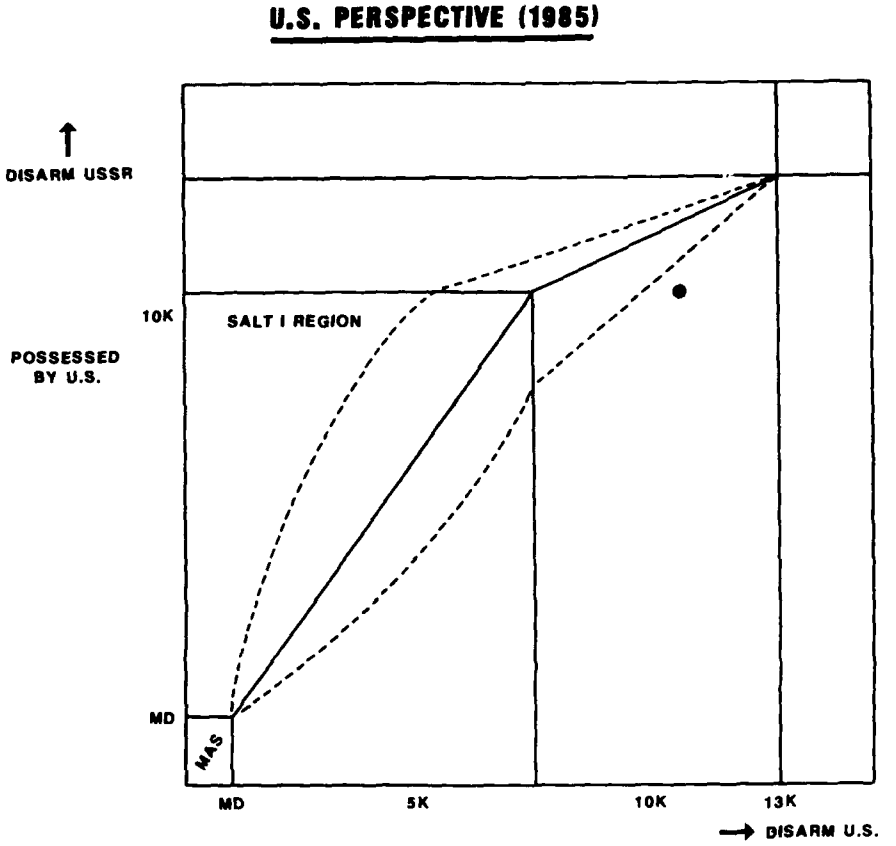


Chart 24

1978, the Soviets were surging ahead. The "plot" is within the SALT I region because, although the region had expanded considerably, the "instability" associated with the SS-18/19 had not yet been recognized.

Chart 25 assumes the M-X and D-5 are "added on" to the present level of U.S. forces wherever reasonably possible. In general, this means replacing MM II with M-X and the remaining single warhead SLBM's with D-5.[2] The net shift, assuming 2300 such warheads are added, is to the U.S. advantage (U.S. side of the diagonal due to larger base number of stable weapons). Given the possibility that achieving "balance" in the inventory by this method may precede negotiating a balance at Geneva, this movement might not be as destabilizing as some critics have thought. However, the reader should also observe that both sides are now *further* away from the SALT I region and in a more narrow area of stability, hence tolerance for difference, than if the negotiation process had simply reduced the number of Soviet unstable weapons.

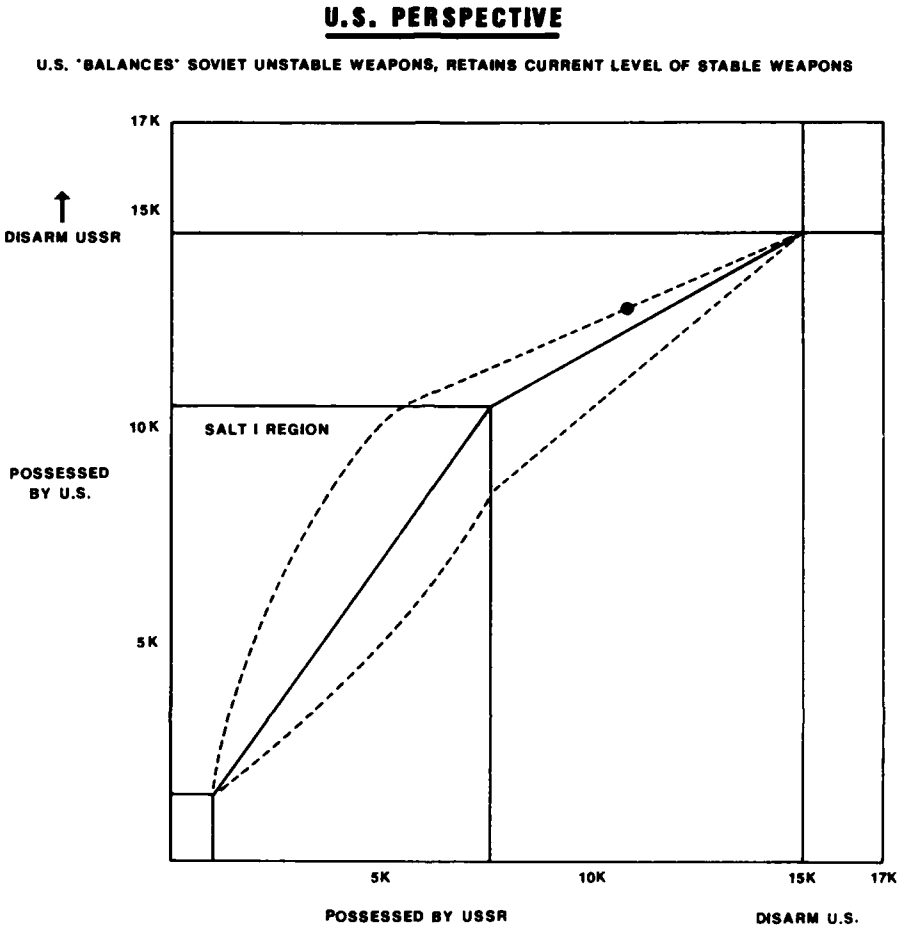


Chart 25

Consider another possibility for the near future. Chart 26 shows the result if the United States were to match the 2300 Soviet prompt hard target kill warheads, and also reduce the number of stable weapons to shift the SALT I box into approximate balance. Although the "balance" is created in the force structure, possibly a precursor action to negotiations, the distance to return to the SALT I box is now further increased and the tolerance for difference greatly reduced. If the thesis of balance then *negotiate* is correct, then this particular combination would achieve arms race stability ahead of crisis stability—exactly the opposite of what is desired; by creating a "balance" of unstable forces, crisis instability is increased. This appears to make a stronger case for a move to strategic defense, if SDI is used to counter (or balance) the unstable systems.

There are a couple of conclusions which can now be drawn. First, it appears we are heading into an area of lesser tolerances for difference due to the

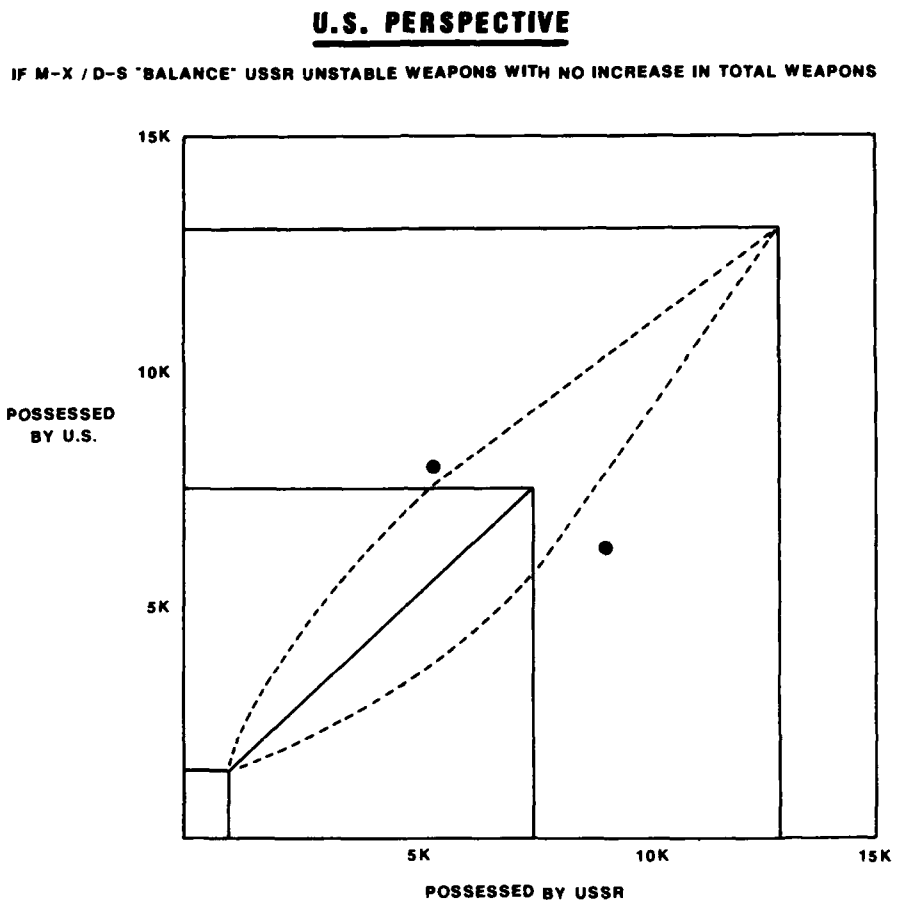


Chart 26

introduction of increasing numbers of unstable weapons. Which party introduced the weapons first is of little consequence. The fact that these weapons may be determining the course of the arms race is the important factor. Once large numbers of these weapons exist, political motives may demand balanced inventories before the negotiation process can arrest the movement toward absolute instability (the upper right-hand box). However, creating a "balance" in inventories of unstable weapons also dictates less room for negotiation.

Further, if defense is introduced in these regions of lesser tolerance, the effect of defense will be far more difficult to measure. Offsetting offensive reductions by introducing defense will be more difficult to calculate and agree upon, and we may find ourselves in a situation described best by Charts 15 through 17. In this case, one side has the technology of defense but, because of the perceived abrupt "upsetting" of the balance by the defender, the other party increases offensive forces.

An argument was offered previously that early deployment, probably preferential and low effective, defenses make only a contribution to "uncertainty" of success, especially of the disarming strike. However, if one side introduces defense, while the other side offsets this defense with unstable offensive forces, the "failure" of defensive systems to "defend" becomes significant (see Chart 18). The statistical contribution for defense rapidly becomes one of "certainty" of failure of greatly imbalanced offensive forces rather than uncertainty of success. The defender thus bears the entire burden of maintaining stability and, if unsuccessful, also bears the entire burden of that failure.

It would seem, then, that the path being undertaken by increasing prompt counterforce weapons is not only dangerous from the perspective of stability in an offense-dominated environment, *it may even preclude a shift to defense without exceptional risk.*

It is here that a consistent, complementary, policy of arms reduction, negotiation and (perhaps) defensive system introduction becomes a paramount. As stated earlier, introduction of strategic defense can be coupled with offensive reduction to maintain an approximate position of balance. But it is now clear that the offensive reductions *must* be in the category of counterforce[3] weapons—otherwise defense will have the effect of *augmenting* rather than decreasing offense. Referring back to the general structure of mechanisms for achieving deterrence, as active defense becomes efficient at performing the counterforce aspect of deterrence, the only offensive reductions that allow for relative balance of concepts are reductions in systems those which also performed the counterforce task.

The previous chapters have established a general framework for achieving the U.S. objective of a stable, mutual, extended deterrence of conflict with the Soviet Union in either the NATO arena or a central system, nuclear, war escalating from other tensions. It should be clear that active defense (SDI) is, at least academically, a legitimate policy option which could either augment or replace offensive forces. It should be equally clear that defense could prove dangerously destabilizing to an increasingly precarious balance. Or defense could provide relief from a ratcheting offensive arms race. The answer depends on what is done concurrently with offensive forces and with arms control.

But, it is not sufficient to conclude that national interests and objectives could potentially be supported by SDI. It is necessary to extend the analysis to a treatment of supporting strategy before conclusions can be drawn and recommendations made concerning whether or not to pursue the path of active defense. It is the purpose of the following chapters to more closely examine the models and theoretical concepts derived thus far with respect to the current U.S. strategy of Flexible Response. The specific objective is to construct guidelines by which the "transition period" might be manageable.

Whether or not the recommendations are politically feasible will be left to the reader.

Now, a personal note to a reader who may have experienced some difficulty following these last charts, or one who questions my "accuracy" in plotting various historical positions. To be direct, I share the frustration. I am almost convinced that the "model" has great utility framing the general argument, or in pointing out critical issues for further examination. But it loses its utility, quickly, when examining the issues in detail. At that point, more complex, exacting models are required. Still, I believe it captures the general environment.

Notes

1. The Chart is relatively insensitive to the number of bombs carried by manned aircraft; "4" is selected as a common number which appeared in *Janes*, and in texts on the nuclear problem. Similar conclusions can be drawn using 3, 4, 5, 6, or even 10. The driving factor is missile warheads.

2. The calculation is based upon 450 M-X, not the 50 presently funded. The point is, a straight M-X/MMII exchange, which is *technically possible*, would create the balance.

3. Obviously, the "prompt" counterforce weapons (ballistic missiles) should dominate the reduction scheme.

Part II
The Transition Period

VII
The Strategic Choices and Flexible Response

Several recent authors have observed that a world where nations could defend, but could not offend, would be an equally stable, and perhaps more safe, world than what we have today. It is the purpose of this part of the book to examine the changes in strategy, and supporting forces, which might occur in a transition to a defense dominant environment.

Any discussion of nuclear strategy must begin with the question of whether or not a nuclear war can be limited. If one accepts that a nuclear war *cannot* be limited, that any exchange leads to global devastation, then the sole utility of nuclear weapons is deterrence. Further, it is *fundamental* deterrence (versus extended), because threatening mutual suicide is not credible for anything other than preservation of one's own survival. Because the assumption is that an exchange cannot be limited, Massive Retaliation becomes an appropriate descriptor for the strategy.[1] Supporting weapons should be designed to facilitate the assumed level of destruction and, hence, would be biased toward maximizing collateral damage. There would be little demand for accuracy and certainly no tactical incentive for reduction of yield. Studies examining this approach have concluded that as few as 1,000-1,500[2] of the "proper" weapons (large yield, heavy fallout, etc.) are required to achieve the capability to implement this strategy. Operating with the "NO" assumption, (that is, no limited nuclear war possible) a "one-time-use" command and control system could be easily justified and any references to, or requirements of, a protracted exchange scenario could be discarded. However, if prompt counterforce weapons *did* exist, despite the seeming incongruity with the "NO" assumption, their presence would dictate constructing an impeccable indications and warning (I&W) system as a buffer to preclude "launch on error."

If, on the other hand, one answers "YES" that a nuclear war can be limited, then the environment takes on a much more complex shape and a spectrum of tactical concepts emerge which produce a very different retaliatory strategy. Under the assumption that limitation is possible, one must contemplate how the conflict could be either contained or halted once initiated. An attempt to "limit" implies a restrained retaliation. Further, one must also consider that the "limitation" or termination may not be successful on the first attempt; successive, small, nuclear exchanges may be necessary. Thus, under the assumption of "YES," limited, controlled, and potentially protracted exchanges become central to deterrence.

But the major issue is still: on what terms could limitation occur? Is it possible that a nuclear exchange could be halted if both powers experienced a "taste" of the exchange well below that of wholesale devastation, yet clearly foreboding disaster? Such a possibility might dictate retaliating against militarily significant targets, limiting collateral damage, and preserving the opponent's I&W/C3I systems. Can a nuclear war be terminated, under a concept of limiting damage to both sides—basically a "tit-for-tat" exchange concept? Or, should one seek to *dominate* after an exchange in order to enforce a halt? This latter approach, especially, requires *counterforce* targeting *or* a preplanned, and structured, superior rung on the escalation ladder to which one could threaten to proceed. If one accepts the path of escalation dominance, the consequence is that one must also define war termination "on favorable terms," develop a warfighting approach and, finally, entertain the ultimate in escalation dominance, the ability to disarm the other side. Unfortunately, this range of retaliatory options parallels and underpins the strategy of Flexible Response and its sophisticated escalation structure.

Also unfortunately, and in contrast to what might seem logical on the surface, a damage limiting strategy requires *more* weapons than a strategy which is designed to maximize damage. The multiplicity of potential retaliatory options associated with Flexible Response dictates at least an order-of-magnitude increase in the number of targets and weapons over the concept of Massive Retaliation. The answer "YES" is thus seductive and, some argue, counterproductive.

Critics argue that Flexible Response compels a decision maker to think through, and develop, a warfighting capability which, in turn, makes a nuclear war more likely. Initiation of an exchange becomes more "tempting" the greater the belief that it can be limited and/or the closer one approaches a disarming capability—which may well follow from constructing counterforce retaliatory options. On the other hand, supporters of Flexible Response point out that Massive Retaliation lacks credibility because the choice in crisis is suicide or capitulation. Further, if deterrence should fail, and the choice made to carry out the strategy of massive retaliation—civilization ends—when it might have been possible to halt the exchange. Given any possibility

at all of failure of deterrence, or of an "unintended" exchange, supporters of Flexible Response establish a moral imperative to *attempt* to terminate; thus Flexible Response is their only alternative.

Two intellectual inconsistencies thus surface pertaining to nuclear strategy and supporting forces. First, the assumption that a nuclear war might somehow be limited requires more nuclear weapons than the assumption that it cannot. Second, contribution that nuclear weapons make to deterrence is based upon the assumption that the exchange cannot be limited, whereas restoration of deterrence depends upon the assumption that it can. But we must choose a position because, in practice, no compromise positions (such as "yes maybe" or "no but"); "yes" or "no" drive strategies and force structures which are radically different. One must make the hard choice of Yes or No. The choice is further complicated because Massive Retaliation only provides for fundamental deterrence; if the United States adopts Massive Retaliation for central system nuclear forces, some other mechanism must be found to achieve extended deterrence. The options here range from U.S. non-nuclear forces (which are expensive) to non-U.S. nuclear forces (which dictates proliferation of nuclear weapon technology).

The choice of "YES" or "NO," especially as applied to central system nuclear forces, therefore, demands that the remainder of the linkage concept be considered. Here, the same "YES" or "NO" question has to be resolved relative to theater or intermediate nuclear forces—if the answer is "NO," then discrepancies in the conventional force balance will obviously dominate the debate over how to maintain the objective of a stable, mutual, and extended deterrence.

For the United States, the basic choice was made by the Kennedy administration as "YES" with the adoption of Flexible Response, and that strategy has matured under successive administrations. But, as critics feared all along, weapons have been developed which broach the more objectionable aspects of the strategy—effective warfighting, especially by the party initiating the exchange, with some discussions of escalation dominance. It is becoming increasing difficult to distinguish between weapons which support the damage limitation/escalation dominance concepts of Flexible Response and those which violate the premise of deterrence by achieving an advantage in a first strike. In terms of the previously developed model, the upper right-hand region is being rapidly approached.[3]

These sorts of issues must have seemed relevant to President Reagan when he proposed the Strategic Defense Initiative. It seems to have been his objective to direct the scientific community to offer another choice—to move to the defense dominant world mentioned in the preface. It also is becoming clear that the President does not propose to change the basic objective, deterrence, but rather to remove the "immoral" aspect of national defense through nuclear offense in retaliation. If one accepts that as the

President's intention, then it becomes important to more closely examine the objective, deterrence, and determine how introduction of defense might contribute or detract from that objective.

Deterrence, as structured today, is extended deterrence—with the extension being provided primarily to European security. In Europe, U.S./NATO conventional forces face superior U.S.S.R./Warsaw Pact forces. This automatically ensures a *defensive only* NATO position congruent with the defensive nature of stated NATO objectives. However, should the Soviets initiate aggression, U.S.-controlled nuclear forces in the European Theater are poised for immediate retaliation. By virtue of U.S. control over these systems, Soviet retaliation against the United States is considered likely. The "incredibility" of this scenario—that the Soviets would risk their own survival to conquer a devastated Europe—is designed to achieve deterrence. This is the essence of the linkage argument and it "couples" U.S. survival to European security.

By virtue of a decade of stated non-aggression policy, the United States also accepts a concept of "mutual" deterrence, vis-a-vis the Soviet Union; thus the basic objective of deterrence becomes one of mutual extended deterrence. Seemingly complicated enough already, another adjective must also be added—that of stability. In the ideal world, mutual extended deterrence would be achieved without constant "tinkering" or revision of supporting forces and scarce national resources could be turned to other demands.

If the President intends to preserve the present objective, a stable mutual extended deterrence, then the transition period of introducing strategic defense must be examined against that objective, the strategy (Flexible Response) and the supporting forces. In order to do that, it should be recognized there are several interpretations of the final position of a strategic defense. These interpretations are:

A. A condition where the "disarming" strike is so complicated that *uncertainty* dominates rational calculations.

B. A condition where "disarming" is not possible, because nuclear retaliatory systems are defended with relative *certainty*.

C. A condition where certain types of nuclear weapon delivery capabilities are negated (usually ballistic missiles), yet other nuclear delivery capabilities exist.

D. A world where nuclear weapons have lost their utility, but conventional (non-nuclear) offense is still possible.

E. A defense dominant world, in its entirety; in other words, a defense against all types of offense, nuclear and conventional.

These descriptions are offered in the order of what is generally consisted to be technically feasible, from least to most difficult. Hence this is the chronological order of what we are likely to encounter as choices, during a

transition period. It is arguable whether these choices are technologically independent or whether a lesser earlier option may be mandatory for a later capability. For instance in order to achieve "C," is it necessary to achieve "B"? Certain common technologies permeate all choices, such as computerized battle management. Others technologies seem specific to the objectives, such as endo-atmospheric interception for terminal defense against ballistic missiles. But these five choices are sufficiently different in their influence on the strategic environment, and likely to occur in a specific order, that this 5-way breakout is handy for analysis. Each also has considerably different implications for strategy and supporting forces. Further, it seems possible to set any of the above as the "final objective" for defensive capabilities.

Concerning strategy, Flexible Response dictates an availability of numerous retaliatory options—with increasing flexibility required as one covers more of the spectrum of possible strategic goals. The more one attempts to span the entire spectrum, the greater the number of weapons required—and/or, the more demands one places on an immediate retargeting and C^{3}I capability. I suggest that the Flexible Response strategy contains the following possible goals in "descending" order:

- Disarming (prompt counterforce or CF)
- War winning (counterforce)
- Favorable war termination (CF)
- Escalation control for dominance (CF)
- Escalation control for damage limitation (CF/countervalue)
- Flexible targeting/execution for signaling intent to proceed or to achieve inter-war bargaining (CF/CV).

Attack size varies with each of these approaches, from quite "small" executions at the lower end of the spectrum to extremely large options at the other end. "Small" is in quotes intentionally. It is ludicrous to contemplate something like a "surgical nuclear strike" since we are dealing with weapons of mass destruction, hence "small" is an easily criticized term. Here "small" is meant in the sense of being below the threshold of mutual destruction, with the specific intention of bringing the conflict to a halt before that level is reached. "Confident," means some interpretation of statistics that would cause a decision maker to conclude that the strike would go as planned with a specified degree of certainty. The specific statistical measures are important because a strategic defense influences these variables in different ways, as will be specifically addressed in "The Planners Perspective."

On the grand scale, Flexible Response blends the *certainty* of clear signalling (the lesser attacks) with either *certainty* of failure or *uncertainty* of success at the higher levels of initial attack. It is the nuclear planner's problem to integrate the available weapons with the appropriate statistical measures and to arrive at a supporting force structure/control mechanism to implement Flexible Response and achieve a stable, mutual, extended deterrent environment.

Notes

1. This is the more contemporary usage of the term Massive Retaliation and is specifically tied to fundamental deterrence. It differs from Dulles' usage of the term in the early 1950's. Massive Retaliation (or the choice to retaliate at the level of your own choosing) at that time met with no apparent consequences to the United States—hence there was no need to distinguish between fundamental and extended deterrence.

2. The TTAPS, "nuclear winter," et al., literature suggests a lower threshold for terminal damage. Other studies, while supportive of the concept of massive and unpredictable environmental effects from a nuclear exchange, point to possible order of magnitude errors in an "all land", or "all water", earth model—as well as inherent errors in atmospheric air current equations. Given these uncertainties, I have opted for the 1,000-2,000 range.

3. Again, it will *probably* never be reached, but the mechanism for avoiding the region seems to be an ever increasing offensive, arms race as discussed earlier.

VIII
The Planners' Perspective

The point of this chapter is that a military planner must make judgments, based on statistical considerations, of what might occur during a retaliatory strike. In the absence of defense, all of the variables are known to the planner and, generally, under his control. A defense greatly complicates the environment. Some reasonably sophisticated probability functions will be used to explain how defense changes the expected distribution of possible outcomes of a retaliatory strike. It is not the intent here to rigorously predict what will occur, but instead we wish only to show how defense may so compound a military planner's problems that certain aspects of strategy may have to be altered.

Three types of statistical measures become interesting in evaluating the relationship between SDI and Flexible Response. First, *expected value* is important in determining the number of events that should occur (weapons arriving on target, the damage expectancy of the attack, etc.), so that offensive planners can approximate the required attack size (a critical aspect of Flexible Response, it will be recalled) and weapon allocation pattern. Second, the statistical confidence that the specific event will occur can be calculated from two perspectives: the confidence that *at least* the number of events required will occur; and, the confidence interval about the expected value to measure whether that number, and *only* that number, will occur.[1]

To elaborate by example, consider the following. A military planner is directed to structure a retaliatory attack against a single target which, because of the characteristics of the target, requires two detonations to create the desired level of damage. Due to combinations of offensive system reliability, accuracy, etc., the planner may calculate that it requires four weapons to be launched in order to achieve an expected value (mean) of two detonations at the target (i.e., the offensive system has a 50% probability of detonation at the target).

However, as with the flip of a coin, there is also the statistical probability that other combinations of success and failure, besides the expected value of

two successes and two failures, will occur. In fact, using round numbers for our example, there is a 5% chance that each of zero or four detonations will occur, a 25% chance that each of one or three will occur and a 40% chance that the expected value of two will occur. Our planner, then, must concede that there is only a 70% chance that the desired target damage, or greater, will be accomplished if four warheads are launched; in other words, there is a 30% chance the target will not receive the required level of damage. If the target is of the counterforce category, i.e., to perform the damage limitation task, a 30% chance of failure is obviously unacceptable. The planner would then increase the attack size to achieve a greater confidence that the desired level of damage would be done.

On the other hand, the planner may be directed to limit collateral damage or not to exceed a specified level of damage on the target. Such might be the case for countervalue targeting, or if the number of weapons available for execution were limited. In our example, there is a 90% chance that between one and three detonations will occur. With these latter considerations, a planner might be quite satisfied with an attack of four warheads; in fact, an increase in attack size might exceed specified damage levels or waste weapons.

Quite obviously, the simplest solution to the planner's problem of having to compromise between measures of effectiveness is to increase warhead reliability. With a high reliability, the statistical intervals derived by the three methods of measure become extremely narrow. In fact, it is easily shown that, with an offensive system reliability approaching 1.0, the three problems converge on a solution of 2.0 warheads.

These statistical measures, and their influence on Flexible Response, come into play when considering how "signaling" might be accomplished in an exchange scenario. The nation employing offensive signaling, hopefully, has complete knowledge of the attack structure, intended targets and the statistical profile of possible damage. But, even with verbally communicated intentions, the *attacked* nation's active interpretation of the attack begins with detection of actual delivery system launch, and initially consists solely of attack size. As the attack progresses, more information becomes available to the nation being attacked. Prior to weapon detonation the specific targets being attacked can, using rather optimistic assumptions, be identified, and expected damage calculated. Once the attack is complete, the attacked nation has "complete" information, albeit subject to information gathering and dissemination problems.

Effective use of Flexible Response (or any successful use of small options) depends upon clear information being received and correctly interpreted by the nation being attacked. Ambiguity during the attack, concerning level of attack or type of damage likely to be caused, ill serves the escalation control purposes of the strategy. One must also remember that only limited time may

be available to evaluate these "signals" and that the overall environment of a nuclear attack is largely unknown. A nuclear planner, then, must not only create a wide range of retaliatory options to support the strategy, but must also consider how, and under what conditions, the response is likely to be interpreted by the other side. Wide disparities in attack characteristics, which cause the planner to increase attack size to account for measured "failures," add ambiguity to a situation where clarity must dominate.

A strategic defense further exacerbates the attack planner's problem. Whereas improvements in offensive system reliability are under the control or within the scope of knowledge of the attacker, defensive characteristics are clearly not; additionally, the attacker will probably not even *know* the defensive characteristics, except within wide bounds.

Before going into more detailed examination of the statistical problem posed by defense, it is necessary to break out where, in terms of strategy, the latter two statistical measures of "confidence" might become important. If a planner is tasked with a *countervalue*[2] attack, it is reasonable to conclude that the *confidence interval* would dominate the calculations. Countervalue attacks, assuming Flexible Response is the strategy, demand lower levels of damage because their purpose is political signaling—to demonstrate a willingness to proceed, to invite inter-war bargaining or to provide a sample of the damage that can be imposed. (This might be compared to the final exchange described in Hackett's *The Third World War*). Wholesale devastation, if achieved, could lead to rampant escalation, which must be avoided. This means the attack planner must concentrate on achieving neither more nor less than the desired damage—i.e., the focus is confidence interval.

On the other hand, a *counterforce* targeting problem will drive the planner toward controlling the probability that "n" events *or more* will occur, regardless of political requirements of Flexible Response. Here the main goal is to make sure the intended targets are destroyed. Counterforce targeting demands that damage expectancy and confidence level, rather than confidence internal, dominate the planning. In a situation where defenses do not exist, it is possible to make these statistical measures coincide by achieving significant warhead accuracy and reducing warhead yield, as mentioned previously. This particular situation has allowed nuclear planners freedom from the dilemma of compromising between the measures and, absent defenses, there is little statistical complication of a "limited" counterforce strike within the strategy of Flexible Response.

However, introduction of defense may well drive these three offensive planning considerations in sufficiently different directions that a simultaneous solution satisfying each of the statistical measures is impossible. In short, strategic defense will greatly complicate the planning problem—perhaps even excluding a simultaneous solution. The presence of mutually exclusive planning solutions may well dictate that the strategy, which these planning

solutions support, is void. In order to evaluate *that* proposition, it is necessary to examine the statistical relationships more closely.

The approach taken will be to examine a *general* equation of the events in a nuclear attack in a defended environment. The following variable names will be used:

NL = the number of warheads *launched* at the target

II = the number of *interceptors* available for defense

P_k = the probability that an interceptor will "kill" a warhead

NA = the number of warheads arriving at the target (assumes detonation)

The general relationship of these variables, in the most simple case, is:

(equation 1) NA = NL*(1-P_k)**(II/NL)

A reader who has studied these types of engagements will recognize several embedded assumptions. First, multiple engagements of warheads are allowed—thus the exponent to determine the attrition rate (II/NL). Second, constant defense effectiveness is represented, with no degradation for an overwhelming attack, nor an increase in effectiveness for a limited attack. The point of using this simplistic equation is that the more complicated engagements can be derived from this base case. (For instance, defense saturation or exhaustion can be measured by limiting II and the single engagement scenario established by setting II=NL.)

The most significant limitation of this simplistic equation is that the distribution of the engagement may vary widely with NL. Where the defense is heavily taxed, its effectiveness could be expected to diminish rapidly; under a less stressing attack, defense effectiveness would probably increase. We shall, however, for the sake of simplicity, use a constant level of defense effectiveness. This assumption will de-emphasize the statistical dilemma an offensive planner must make rather than magnifying it. It should be further noted that the planner must actually calculate Damage Expectancy (DE), which is a further multiplication of the NA term by the following:

(equation 2) DE = NA * (1 - (1-PD)**NL)

(Where PD is the probability of damage of the warhead to the target, given the warhead arrives. PD, in turn, is made up of many complicated, and imprecisely measured, terms.)

Returning now to the more general case and using a binomial probability density function of

$$\text{(equation 3)}\quad P(NA=k) = \binom{NL}{k}((1-Pk)^{**}k)(Pk)^{**}(NL-k)$$

and,

$$\text{(equation 4)}\quad P(NA>k) = \sum_{i=k}^{NL} P(NA=i)$$

The offensive planner must make *all* of these calculations in comtemplating an attack.[3]

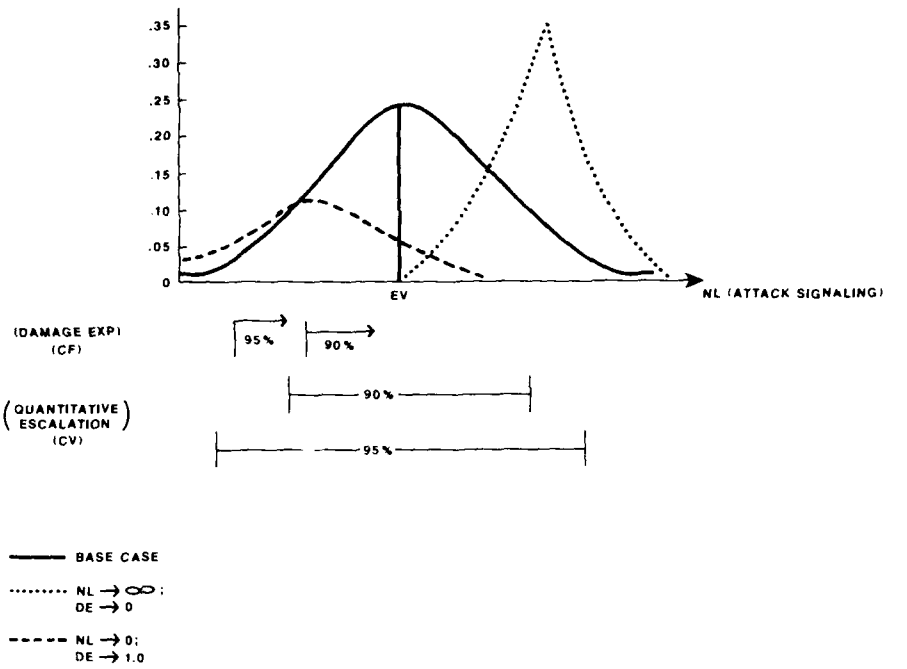


Chart 27

Rather than drag the reader through a series of specific calculations, the point of this chapter is to establish a general relationship between defense and the offensive force planner's problems of clear signaling. Therefore, only the generic curves will be used in the body of the text. Chart 27 provides the probability density distribution for equation (3).

The independent (X) axis is the number of warheads launched (NL from the previous equations) and the dependent axis (Y) is the probability that *exactly* "x" warheads will arrive. The "base case," for discussion purposes, is plotted with a solid line. As expected, the highest probability of occurrence is the expected value, which can also be computed by multiplying the complement of defense effectiveness ($1\text{-}P_k$) by the number of warheads launched (NL). Additionally, the probability density function is symmetric about the expected value—demonstrating that no bias exists on attack size, as mentioned earlier. The assumptions underlying this distribution are: the attacker knows the level of defense effectiveness; defense effectiveness is constant for all attack sizes; the defense is inexhaustible; and, the defense employs only a single shot capability. These embedded assumptions favor the offensive planner's situation and should therefore allow us to extract optimistic results rather than overstate the problems caused by defense.

Having displayed the generic distribution of events facing the planner, it is important to see how different values of defense effectiveness or the number of warheads launched might influence the situation. As shown with the dotted

line (....) in Chart 27, the curve compresses about the vertical expected value line as either NL increases or defense effectiveness (P_k) decreases; at the same time, the expected value for the new distribution increases. The most extreme case of each would be where: P_k=0 (no defense), and the curve becomes a "point" where NL=NA and the probability density function for NL=NA is 1.0; or, where NL equals "infinity" and, once again, the curve becomes a point at 1.0—indicating the defense had been overwhelmed.

However, as the defense effectiveness increases, or the number of launches decreases, the opposite shift is seen—as shown by the dashed (—-) line in Chart 27. The nominal curve "flattens out" as either: the number of warheads launched approaches zero; or, the defense effectiveness approaches 1.0. There is also a corresponding lowering of the expected value and its frequency of occurrence. The extremes here (NL=0 or P_k=1.0) would result in a horizontal line beginning at the origin (0.0). By referring to Chart 27, a reader should be able to grasp how these variables generally influence the distribution of warheads arriving, versus the attack size initially launched.

Below the X-axis in Chart 27 are shown the confidence intervals and confidence levels, for the base case distribution. (Both a 90% and 95% confidence factor are displayed because, as will be shown later, a planner's calculations are heavily influenced by the confidence required, with the effect being magnified above 90%.) Recalling that "signaling" in Flexible Response includes both interpretation of the size of the attack (measured by NL) and the amount of damage cause (NA), one can now begin to visualize the planner's dilemma.

Assume that the planner's task is to create *at least* a certain level of damage against a defended target set (usually attributed to counterforce targeting), that 90% confidence of that level of damage (or greater) is the requirement, and that that damage requires detonation of "m" warheads. For NL=m, because of defense, NAm; therefore, the planner must increase NL until the greatest lower bound (GLB) of the 90% confidence level equals "m." This amounts to, on Chart 27, moving the first confidence measurement to the right. In this case, NL is increased until P(NA m) = .90 making a corresponding increase in the Expected Value of detonations. However, this does not completely solve the problem. If the planner is also directed to structure the attack so that *only* a certain level of damage is done (most likely countervalue targeting or counterforce with minimal collateral damage), then the planner must entertain the second confidence measurement, the confidence interval. Having already increased NL to a point where there is 90% confidence that "m," or more, will detonate, the planner must *decrease* NL in order to place "m" as the midpoint of the 90% confidence interval—recall that the distribution is symmetric about the expected value. Thus, for defended targets, there may well not be a simultaneous solution of NL for the planner's problem.

This particular situation might not be too much of a practical problem were it not for several factors discussed earlier. First, there appears to be little distinction, now, between countervalue and counterforce targeting as both the United States and U.S.S.R. may be operating under the assumption that each side values their forces highest. Thus confidence level and confidence interval requirements are likely to be imposed at the same time. Second, as the difference between NL and NA increases (due to increased defense and/or lower attack sizes) the signaling accomplished by launch size (NL) and damage caused (NA) diverges—introducing ambiguity into a situation where clarity is the driving variable. Last, and perhaps most important, even these rudimentary calculations are based upon *perfect* knowledge of the defense by the attacker; a very optimistic assumption which will be treated in more detail shortly.

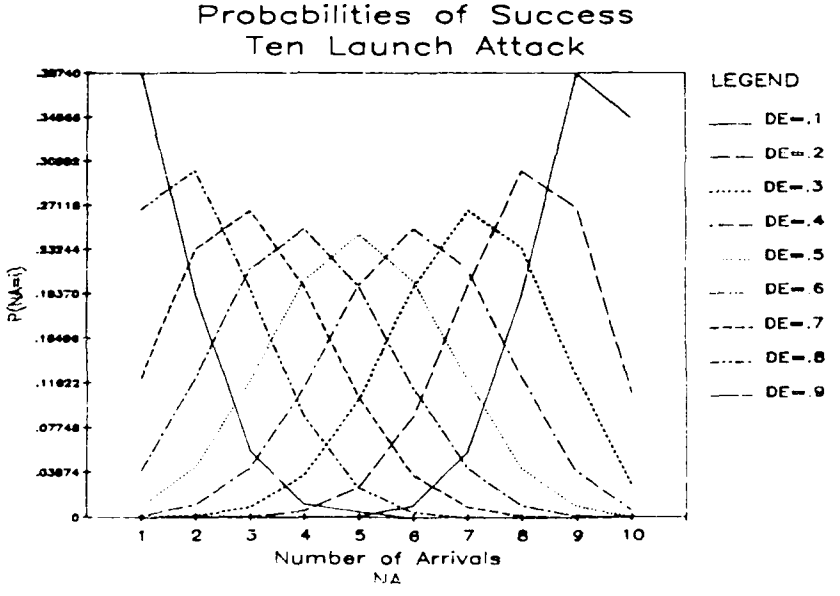


Chart 28

Before introducing imperfect knowledge of the defense, it is necessary to conclude the more basic case with the observation that this divergence between NL and NA, for lower threshold attack sizes, occurs at quite *low levels of defense effectiveness* (P_k). Chart 28 displays the probability density function for Defense Effectiveness intervals of 10% against an attack size of 10.[4] What we see from Chart 28 is that the first increment of defense, 10%, only causes a minor dispersion in the density function. However, beginning at 20% defense effectiveness, the dispersion, hence the planner's dilemma,

becomes significant. Beyond 50% defense effectiveness the dispersion is dampened, for the 10 warhead attack, because the value (P_k) dominates equation (3)—the difference between NL and NA increases in proportion to P_k, but the discrepancy of confidence measures is dissipated. Of greatest significance is the observation that the "dilemma" of non-simultaneous solutions seems to occur around the 20%-30% defense effectiveness levels where the probability distribution curves "flatten out."

In other words, the greatest "confusion" introduced by the defense to the planner's situation *occurs at fairly low levels of defense effectiveness*, even having made reasonably optimistic assumptions in favor of the attacker.

It will be obvious to anyone familiar with these sorts of distribution calculations that a simultaneous solution can be created by increasing the attack size. As discussed previously, one can make the confidence level, interval and expected value converge, regardless of defense effectiveness, by increasing NL toward infinity. However, as NL increases the "small" attack characteristics which are central to Flexible Response also disappear—and the response becomes more accurately described as Massive Retaliation. Of additional interest is that the NL required for convergence is also a function of exhausting the defense. Although the defense is treated here as inexhaustible, because we wish to focus the analysis on small attack sizes, it is intuitively clear that these distributions return to the zero-defense relationship upon exhaustion.

But it is also important to remind ourselves that all calculations to this point have assumed that the attacker had complete, and perfect, prior knowledge of defense effectiveness. As this is unlikely to be the case for the defender, let alone the attacker, it is important to the analysis to approximate the influence of uncertain knowledge of defense effectiveness on offense planning. In general, as was the case with building the strategic offensive model in earlier chapters, one would logically expect the attacker to overestimate defense effectiveness, whereas the defender would be more pessimistic. Rather than attempting to model this interaction, we shall proceed from a basis that knowledge about defense effectiveness is derived from observing tests and that the more tests observed, the greater the confidence in an accurate measure, and that both the defender and attacker have the same evaluation of P_k. This latter set of assumptions will, once again, dampen the effect of the variables in question and any estimate of the effect of uncertainty will be understated.

A potential attacker's knowledge of the defense is likely to be limited to intelligence sources, his own simulations and technological level of experience, and imperfect observations of the opponent's operational testing. Mathematically, the attack planner must "weight" equations (3) and (4) by some factor which reflects an error distribution in predicting defense effectiveness. Taking only equation (4) as an example, the following would accomplish this weighting:

$$\text{(equation 5)} \quad P(NA \geq t) = \sum_{h=t}^{NL} \int_0^1 P(h|L) * P(L)\,dl$$

where:

(A) P(h L) is the conditional probability that NA = "h," given a defense leakage of L ($L=1-P_k$).
(B) P(L) is the level of knowledge about the defense.
(C) P(NA=t) is the unconditional probability that NA = "t," calculated as the weighted average of the conditional probabilities over all possible values of leakage (L)—hence the integral from 0 to 1.

Constructing a mathematical approximation of P(L) is controversial at best. What we are searching for is a distribution which is random (no knowledge) when zero, or few, observations of tests are possible and which also approaches 1.0 when many (an infinite number) of observations are possible. Between zero and infinity, almost any relationship between observations and level of knowledge could be justified. Here a Beta distribution is selected for several reasons. First, a Beta distribution is often used in numerical analysis to approximate knowledge gained from "learning curve" situations. Second, a Beta distribution, loosely interpreted, reflects an overestimation by the attacker of defense effectiveness when the number of observations are low, and an "accurate" (non-skewed) estimate as observations increase. Third, and this is particularly important to an analyst, a Beta function integrates easily and/or can be programmed into a small computer.

For the purposes of our treatment of uncertain knowledge of defense effectiveness, we can calculate P(L) as:

$$\text{(equation 6)} \quad P(L) = F(\text{beta})\,(L|f;Ob)$$

$$= \frac{(Ob-1)!}{(f-1)! * (Ob-f-1)!} * L^{**}(f-1) * (1-L)^{**}(Ob-f-1)$$

where:

(A) "Ob" is the number of observed
(B) "f" is the number of observed failure of the defense
(C) "L" is the planned leakage and is equal to f/Ob

Chart 29 shows this distribution for several values of "Ob" and "f." Mathematically, what we now wish to do is map this distribution (equation 6) and equation (3) through equation (5) and determine the effect of imprecise knowledge of defense on the planner's problem. Rather than deluging the reader with a string of equations and charts, only summary tables will be presented.

IMPRECISE PRIOR KNOWLEDGE

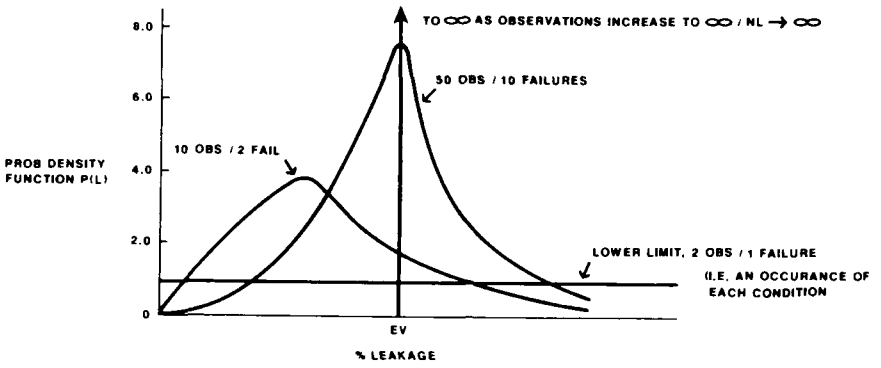


Chart 29

Table 1 (Defense Effectiveness = .20)
See Chart 29A for Distribution

Prior Knowledge		Confidence Level for NA=1			
Ob	f	.50	.90	.95	.99
infinite	--	1	2	2	3
50	10	1	2	2	3
10	2	1	2	3	4
5	1	1	2	3	5

Table 2 (Defense Effectiveness = .30)

Prior Knowledge		Confidence Level for NA=1			
Ob	f	.50	.90	.95	.99
infinite	--	1	2	3	4
50	35	1	2	3	5
10	7	1	3	3	6

Table 3 (Defense Effectiveness = .40)
See Chart 29B for Distribution

Prior Knowledge		Confidence Level for NA=1			
Ob	f	.50	.90	.95	.99
infinite	--	1	3	4	6
50	20	1	3	4	6
10	6	1	3	4	8
5	3	1	4	5	11

Table 4 (Defense Effectiveness = .80)

Prior Knowledge		Confidence Level for NA=1			
Ob	f	.50	.90	.95	.99
infinite	--	4	11	14	21
50	10	4	12	16	26
10	2	4	19	30	77
1	5	4	36	76	397

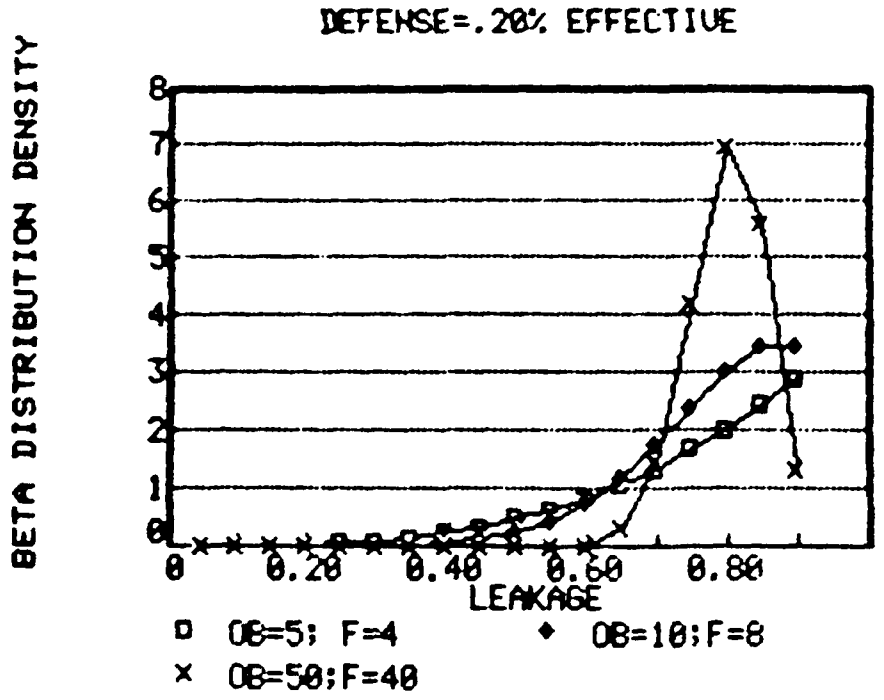


Chart 29A

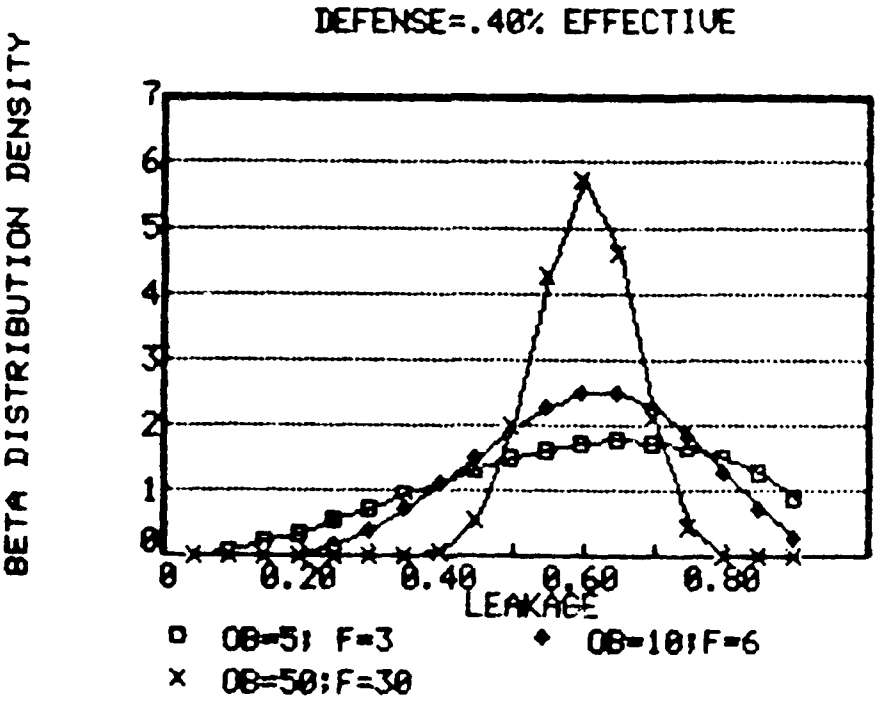


Chart 29B

These tables allow specific interpretations of the influence of uncertainty on the planner's problems. The base case, an infinite number of observations, is identical to complete prior knowledge which is the same as the previously derived binomial probability density distribution. In general the following conclusions can be made:

A. Even for low levels of knowledge of defense, there is little sensitivity in attack sizing as long as required confidence levels do not exceed 50%.

B. As knowledge of defense effectiveness decreases (fewer observations) the attack size becomes extremely sensitive to the confidence level imposed.

C. As the defense effectiveness increases above 40%, as measured by observed effective tests, the attack sizing problem becomes dominated by level of prior knowledge.

D. Below 40% defense effectiveness, attack sizing is dominated by the previously derived statistical measures.

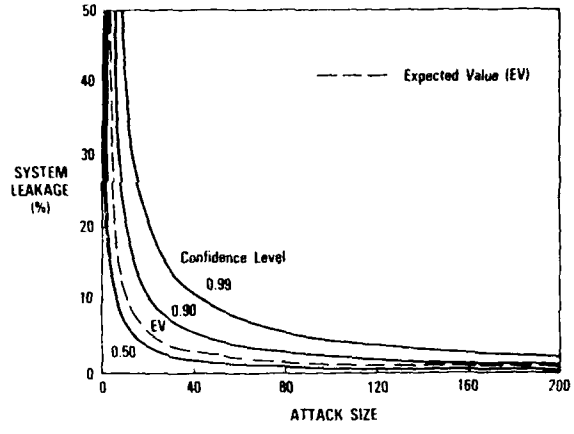
This dominant sensitivity to defense effectiveness is significant because, as many critics of strategic defense point out, complete testing under operational conditions may be infeasible. In fact the more elaborate the defense, hence the more effective it would be postulated to be, the fewer the number of tests, full scale or otherwise, one is likely to be able to either conduct or observe.

The Systems Planning Corporation (SPC) of Huntsville, Alabama has studied these statistical issues from a different perspective, in their report "The Defense Contribution to Uncertainty" to the U.S. Army Ballistic Missile Defense Systems Command (BMD) (SPC Final report number 1000, December 1984). Although the study was performed for different purposes than this one, some extracts of their calculations and observations are useful in confirming/elaborating the observations made earlier about the general defensive environment.[5] First, from the SPC Executive Summary,

> "Offense uncertainties about leakage can further increase attack requirements up to a point of interceptor exhaustion. There is a marked increase in attack price (above that derived from random effects alone) required to achieve high confidence as the level of prior knowledge decreases. For example, for 90 percent confidence of at least one penetrator and an inexhaustible defense with an expected leakage of 20 percent, the required attack size increases from 11, if the leakage is known precisely, to 36 for a relatively low level of knowledge of leakages. As the required confidence level increases, the effects of a given level of uncertainty become more pronounced."

Although the SPC study focuses upon the 80% effective terminal defense (20% leakage), they produced a useful sensitivity study for our analysis, see Chart 30. The "confidence level" referred to is the probability that "n" or greater warheads will arrive at the target—hence is the statistical measure associated with a counterforce attack. Their data also indicates that, for a requirement of a single warhead to arrive on target, the statistical problem emerges at approximately 25% defense effectiveness, becomes sensitive to desired confidence level at 50% effectiveness (extremely sensitive at 80%),

SENSITIVITY TO SYSTEM LEAKAGE
(INEXHAUSTIBLE DEFENSES; AT LEAST ONE PENETRATOR)



Required Attack Size				
System Leakage (%)	Confidence Level 0.50	EV	0.90	0.99
100	1	1	1	1
50	1	2	4	7
20	4	5	11	21
10	7	10	22	44
5	14	20	45	90
2	35	50	114	228
1	69	100	230	459

Chart 30

and, for defenses over 90% effective, imposes quarter to half order of magnitude increases over EV attack sizes to achieve reasonable confidence in "success." When also considered against the statistical interval of "90% confidence that *exactly* 'n' will arrive," the planners problem quickly becomes insolvable.

It is interesting to add to this argument that the planner's problem also includes the fratricide issue. What this means, relative to the problem at hand, is that the attacker may not have the option of *increasing* attack size by compressing (overwhelming) the defense of a point target; instead, the attacker may have to increase attack size by increasing the length of the attacking stream. If the attacker compresses the attack, an early success may well void the remainder of the attack, thus *not* providing more warheads on target but, instead, contribute to the "defense" of the target via fratricide. However, increasing the length of the attack stream, even if that were possible by coordinating launch times of independent boosters, may actually *increase* the defense effectiveness because now the defender does not face an overwhelming attack. This is particularly important because a defense which is, say, 20% effective when facing a 10-20 warhead simultaneous attack may actually be 80-90% effective against a stream warhead attack.

Thus the planner's dilemma is bounded by two types of problems. At the lower end of the attack spectrum, a planner must select the greatest lower bound of the statistical considerations, fully recognizing that ambiguity is added to Flexible Response launch signaling in proportion to the increase in attack size. At the upper end, a planner is constrained by manageable attack

size and the fratricide issue. It is possible that the greatest lower bound of one solution may exceed the least upper bound of the other. Whether or not it does will determine if a planner can even hypothetically construct the retaliatory option against the defended target.

It is the conclusion of this author that these sorts of problems arise at low levels of defense effectiveness, probably around the 20-30% level for terminal defenses. However, a case can be made that the terminal defense situation, as treated here, is biased in favor of the defense. Specifically, if targets are not of uniform value (or hardness), then the offense can apportion the attack to overcome the defense/hardening without making a blanket increase in attack size as suggested by this analysis. With lower values of defense effectiveness a simple doubling of the attack size against specific targets has the effect of dramatically increasing offensive effectiveness against defended targets, without also doubling total attack size. A more detailed analysis might also indicate that existing inventories of launchers could be modified to double the number of warheads. It is therefore necessary to make a cursory extension of the analysis to include more sophisticated types of defense.

The non-preferential (boost phase) defense alternative might offer more leverage, and at even lower levels of defense effectiveness. Consider the following battle management problem for an attacker subject to attrition in the boost phase. In order to maintain the same level of damage expectancy, the attacker must have some method of determining the expected number of warheads arriving at the target, and the associated distribution. Facing preferential defense, the problem can be resolved by the normal statistical methods derived earlier—albeit a complicated problem. However, faced with the problem of boost phase loss, there is no statistical way of correlating loss of warheads with target destination. Thus the attacker has two general choices. Either he can develop a monitor, track, retarget and launch control system (where he must determine which booster is lost, what it contains, then fill the gap), or he must size the initial launch to account for *worse case* loss of high value boosters.

Developing the complicated battle management system is no trivial feat, but might be considered in the same light as developing a battle management capability to perform boost phase or mid course defense, so it should not be excluded. But, even if it were developed, the time cycle for retargeting and launch would have the same effect as spacing out the attack which, for a layered defense, might make each defense phase more effective.

From an attack planner's perspective, a possible reaction to a boost phase threat is to spread high value warheads over a wide number of boosters (this also dilutes the fratricide problems), thus making all boosters essentially of equal value, or one could increase the number of high-value boosters, applying the same statistical techniques used to counter the preferential defense.

While it might *seem* that only a few high value boosters would exist, the fratricide problem probably already dictates that warheads for critical targets be dispersed among boosters. The planner may have boosters which tend to be of approximately equal value (when the total target value of the warheads is summed) and targets of unequal value within each booster. Thus an attack planner, wishing to increase the number of high value warheads, must increase the number of lower value warheads as well. The greater the MIRV ratio, the more compounded the problem and the more "extra" warheads which are introduced each time the planner increases booster attack size in order to compensate for potential loss of high value warheads. The net effect of this is to void any possibility of selective attack against high value targets—the essence of Flexible Response. The effect is magnified at lower levels of attack, as was the case with terminal defense, because defense effectiveness is probably non-linear with respect to attack size.

Conclusions

Although this has been a rather long and drawn out section, the conclusions are rather simple. First, and intuitively obvious from the outset, small attacks cannot be executed with confidence against defended targets. More specifically, because of the statistical treatment which is applied to attack planning, the smaller the planned attack, the lower the confidence that it can be executed as planned. Larger attacks, especially those which might saturate or exhaust the defense, achieve higher levels of confidence.

Second, as the difference between launch sizing and detonation requirements increases, the ambiguity of signaling increases.

Third, the imprecise knowledge of defense effectiveness dominates the attack planner's problem, instilling greater ambiguity into a response; the greater the sophistication of the defensive system, the less precise the prior knowledge of its effectiveness.

Fourth, at some point in a planner's calculations it becomes impossible to structure a lower attack size, for signaling purposes, without creating an unmanageable stream, for reasons of fratricide and increased defense effectiveness. When this becomes the case, the particular response option in question seems to be useless in the context of Flexible Response. This analysis suggests that this situation arises at fairly low levels of defense effectiveness.

To raise this discussion from a level of statistical considerations to a level of strategic implications, the following conclusions are offered:

A. (Preferential Defense). If a target is even moderately defended against a specific method of delivery, then that *target* is eliminated from lower level attacks *by that delivery system*, if these lower level attacks require a *precise* number of either launches or detonations for political signaling. The attacker simply will not be able to find a simultaneous solution to the targeting equations.

B. (Non-Preferential Defense). If a class of *delivery vehicles* is subject to intervention when it is used selectively, then that delivery mechanism is excluded from lower level attack options.

C. "Confident" execution of lower level attacks depends upon an absence of defense against the delivery system selected.

Flexible Response depends on "confident," or precise, matching of political signaling with military response and damage levels caused. If either large target sets, or entire classes of delivery vehicles, are excluded from Flexible Response for the reasons stated above, then either new target sets must be created, new classes of delivery vehicles produced, or the strategy abandoned. It is the purpose of the next chapter to focus specifically on these options.

It should be said, in closing, that the tone of this chapter has been to focus on Flexible Response—a strategy which may well be peculiar to the United States. The reader should realize that all small attack options, such as the "BLACKMAIL" options sometimes attributed to Soviet strategists (i.e., strike U.S. targets in a limited fashion and then demand cessation), would be similarly affected.

Notes

1. These are nominal calculations which are useful in making the desired points in this analysis—to explain, gross terms, the planner's predicament. It is in no way meant to imply that actual planning would be done with these crude mathematical methods.

2. Using the traditional definition of countervalue as urban or industrial targets.

3. A sample attack size of 10 will be selected for ease of calculation, as well as representative of a small attack size. Quite obviously, however, few targets can be found which require 10 detonations to achieve a desired level of damage. It is far more likely than a target *area*, containing 5 hard targets might require a *total* of 10 detonations (2 on each of the 5 targets). However, to achieve 2 detonations on each of 5 targets will probably require more than 10 warheads; our approach thus underestimates the influence of defense, as will be the pattern throughout this analysis.

4. 10 warheads is selected for ease of calculation and display and effect described previously.

5. It should be added that SPC was quite cooperative in discussing this report and often either performed or confirmed the calculations presented herein.

IX
The Impact of Strategic Defense on a Strategy of Flexible Response

We are trying to examine what happens to the general strategy of Flexible Response, and to the concept of extended deterrence, if current offensive weapons inventories are subject to strategic defense. The assumption, of course, is that small options are important to the strategy. Many analysts argue that only the United States possesses such a strategy, that the Soviets adhere to only larger, perhaps massive, retaliatory or preemptive nuclear usage. My approach here is to assume small options are important, then see what impact strategic defense might have from that base.

The impact on strategy and policy of any strategic defensive system depends largely upon what is defended and what it is defended against. If a preferential defense, against a specific nuclear delivery system, is deployed, then we have discovered that the targets defended are eliminated from lower threshold attacks by that delivery system. If a non-preferential defense is deployed, against a specific nuclear delivery system, then we have discovered that that delivery system is excluded from lower threshold attacks against all targets.

The most commonly discussed preferential defense against ballistic missiles involves protecting the nuclear retaliatory capability and selected C^3I nodes. The case of a preferential defense of retaliatory forces against ballistic missile attack therefore seems innocuous—preserving retaliatory forces is the essence of deterrence. A level of defense in compliance with the existing ABM Treaty would, by agreement, have little effect on present strategies. However, expansive use of this preferential defense will eventually eliminate counterforce targeting by ballistic missiles as an element of Flexible Response for the opposing side. Such a system in the U.S.S.R. will eliminate this element in U.S. strategy and vice versa. Referring back to "The Transition Period," this will eliminate features 1 through 4 of Flexible Response, relative to ballistic missiles, because they all depend on counterforce targeting.

This does not mean that Flexible Response through counterforce targeting is totally lost just because the ballistic missile option is unavailable for certain targets. All the attacking side has to do is select another delivery system or

undefended counterforce targets. But it is with this choice that differences in the U.S. and U.S.S.R. force structure begin to matter. Assume the United States wishes to preserve the counterforce option under Flexible Response, and the alternative weapon offered is an airbreather (bomber or bomber carried). We then re-enter the preferential/non-preferential comparison.

The Soviets have extensive non-preferential and preferential, layered, air defense. These defenses probably already preclude selective, high confidence, use of U.S. airbreathers for deep targets.[1] Cruise missiles might suffice for portions of the target set, but their survivability is being questioned in some quarters—plus they have limited range. So there is a significant offense-defense imbalance which must be addressed in the airbreathing component of the strategy.[2]

Assuming that the United States wishes to maintain essential equivalence while shifting to defense dominance, the United States may have to balance the situation with respect to airbreathers. Given the Soviet air defense, and given that they are rapidly increasing their airbreathing offensive element, two alternatives seem appropriate: a continental air defense to balance the Soviet defense; or, an improved U.S. airbreathing threat, to counter the Soviet defenses. Matching the Soviet air defense has the effect of removing the airbreathers from small option execution options for both sides, to the degree that the added U.S. air defense is effective. Improving the airbreathing offensive capability does little for Flexible Response unless the technique is to circumvent the defense—as with Stealth.[3]

In short, what happens as defenses emerge, and they may emerge rather quickly once the process has begun, is that *all* selective execution aspects of Flexible Response may be lost. In fact it seems the only way to preserve Flexible Response may be to *increase* the number of weapons possessed, and the associated attack sizes, and to "play the odds" with the statistical calculations discussed in the previous chapter, to hope the necessary signaling occurs should deterrence fail. Flexible Response thus quickly loses its "precision" as defenses improve and expand to cover different threats. What precision that might remain is masked in the ambiguity derived in "The Planner's Perspective." The strategy may well be more accurately described as Massive Retaliation based on offensive countervalue targeting.

As strategy goes through this evolution, one must recall that Flexible Response was the key to *extended* deterrence. A force structure which is only good for Massive Retaliation is generally considered useful only for *fundamental* deterrence. The next link in the transition chain is, therefore, European security. The "link" that may be broken is escalation to a central system exchange; the tactical nuclear (in-theater) exchange is still feasible, as is conventional conflict at all levels.

However, the point is often made that this now makes Europe "safe" for a superpower nuclear war; this, in turn, drives the consideration of an "anti-

tactical ballistic missile:" (ATBM) in conjunction with ABM (preferential) research. But non-preferential defense in Europe, if matched by the Soviets by improving or expanding their theater defenses, will have the same net effect of removing lower threshold responses with tactical (in-theater) nuclear weapons. Thus we will be confronted with the loss of what might be termed Tactical Flexible Response. Loss of Flexible Response in the strategic arena could be closely aligned with a similar change in the tactical nuclear arena.

But this further disrupts the present linkage concept. With the loss of small, controlled, nuclear options in both the tactical and strategic arenas, the wide disparity in NATO and Soviet-Warsaw Pact conventional forces begins to dominate the issue. It is productive to look at the matter in the following way. The present NATO defensive concept incorporates potential selective use of nuclear weapons for defensive use. Use of nuclear weapons demands reconfiguration of the battlefield (dispersal of troops, donning of protective gear, etc.), from which a return to conventional weapon usage may be quite difficult. Ground forces depend on dispersal and entrenchment for nuclear survival and mass and mobility for conventional warfare; thus posturing for defense against nuclear effects generally precludes effective use of conventional weapons; the reverse is also true.

Thus with *selective* use of nuclear weapons in-theater, small options can be used to "plug holes" in the conventional defense, while maintaining the remainder of the front in a conventional posture of defense. Having selectively used the nuclear response, it *might* be possible to return the conflict to the conventional level or halt short of more dramatic escalation. But as more massive nuclear options are selected (or lesser options eliminated due to tactical defenses), more of the battlefield must be reconfigured and, potentially, any possibility of de-escalation lost. In this set of circumstances, the nuclear release decision becomes nearly irreversible. Hence this decision will also be considerably more difficult to invoke as a defensive option.

This analysis suggests the following scenario as the only one left to create linkage in NATO: Conventional Soviet aggression is met with conventional NATO Flexible Response, until such a point that the NATO conventional forces are losing. With the impending loss of NATO, the United States (or the Europeans) would have to respond with a massive attack against the Soviet Union using theater nuclear forces. The expected Soviet response would be a massive retaliation against the United States which, in turn, would elicit a central system attack from the United States.

At this point, the "incalculability"[4] aspect of NATO Flexible Response must be called into question; in fact it might no longer exist. More specifically, the Soviets can, more plausibly than today, calculate that, unless all of Europe is going to fall, nuclear forces are unlikely to be used. This may open the possibility of a rational Soviet calculation for resolving "the German

problem" to their advantage or even occupying larger parts of Europe intact, without suffering a high risk of nuclear war.

The inability to accurately calculate a retaliatory response ("incalculability") is the single aspect of NATO's current posture and force structure which permits tolerable levels of defense expenditures. As discussed in the opening section, NATO has in place conventional forces which are significantly less capable than the Warsaw Pact—thus NATO does not threaten offense. Sufficient conventional forces exist only to raise the nuclear threshold to a point where ambiguous aggression is not automatically met with a nuclear response—thus delaying the nuclear release decision. With the loss of incalculability (tactical and strategic Flexible Response), NATO faces a defense-offense choice similar to that encountered at each stage of the nuclear arena.

Increasing conventional offensive forces in NATO Europe seems counterproductive to the final objective of a defense dominant world. In addition, such a course runs headlong into excessive costs, as well as going against the stated NATO policy of being *only* a defensive alliance. Too much NATO conventional capability threatens offense. But how does one construct conventional defense without also producing offense?

The long-running debate in NATO over "Forward Defense," and other recent debates over Follow-on Forces Attack (FOFA), reveal that conventional defense is probably technically achievable in the model of the Maginot or Siegfried line. As a method to achieve non-threatening defense, U.S. military technicians have long argued for a more prepared defense. One likely element would be construction of a permanent barrier or "trench" along the NATO-Warsaw Pact border, possibly filled with nuclear demolitions (or some similar powerful conventional device). Secure barriers of this sort can be married to massive air defenses to make conventional offense quite difficult; force structure can then be moved to ready reserve status to continue the "non-threatening" concept. Although this may sound like folly, a "great wall" around European NATO would create a defense dominant position—and it appears to be technically feasible.[5] Other concepts, generally termed "non-threatening" deterrence, are beginning to emerge in defense literature. Here the major point is that as nuclear Flexible Response erodes, one must seriously address the present conventional force imbalance.

Any reader who has examined the European security problem in any depth will recognize that a major objection to this approach is political in nature. Critics argue that such a "wall" recognizes the permanent division of Germany, of Europe, and accepts as a permanent condition Soviet domination of Eastern Europe. Proponents of a defensive conventional posture argue that only a *military* solution is precluded and that economic and political approaches to restore the freedom of Eastern Europe can continue.

Most surprising perhaps is the potential speed at which the existing linkage (Flexible Response) concept could become unraveled, as strategic defense is introduced. The close knitting of the linkage argument to Flexible Response and controlled escalation dictates that even seemingly insignificant alterations to Flexible Response cause major perturbations in every other link. It would seem that the concept would not erode if counterforce were not the key to Flexible Response—or, said in mirror image, if it were credible to perform Flexible Response with countervalue means, then the unraveling might not proceed so quickly. However, it must be restated that even Flexible Response through countervalue targeting would disappear when nonpreferential defenses were introduced.

It seems then that any transition period which begins with ballistic missile defense and leads toward a totally defense dominant environment must also pass through a strategy change to Massive Retaliation. As defined earlier, this change in strategy equates to a change in objective to fundamental deterrence, leaving open the question of how extended deterrence is to be achieved. Further, the change to Massive Retaliation may occur rather quickly.

However, different conclusions can be drawn if the path of defense dominance is initiated at the conventional level. In other words, if the situation unravels when you start at one end, why not start at the other end? Specifically, if the NATO conventional scenario were to be made defense-dominant first, then little need or rationale would remain for Flexible Response with the theater (tactical) nuclear forces; the French model for deterrence in-theater would probably suffice.[6] *If* NATO could achieve this goal, then the adjective "extended" in our objective would be insensitive to a movement to Massive Retaliation in the strategic nuclear scenario. "Decoupling" would have occurred through force structure rather than perceived shifts in interest or will to participate in European security. Decoupling in this technical sense could be without political significance, and should not be highly controversial within NATO.

Still, the likely magnitude of change in global security strategy which would seem to accompany any alteration in the strategic nuclear arena dictates that we increase the analytical scope associated with strategic defense. More specifically, it is folly to treat SDI solely in the context of strategic, superpower, nuclear relations. As suggested in the beginning, the loss of small targeting options may well be more important to the United States than to the Soviets. Hence, for our own well-being, it is even more important that we conduct a thorough examination of how national interests, objectives and strategies might be affected by introduction of forces for strategic defense. This chapter has only scratched the surface of the linkage argument; much more attention must be given to the probably serious impact of strategic defenses, introduced by either side, on Flexible Response, on

extended deterrence and on NATO. We will not pursue this further, here, but it certainly invites further study. Instead, we will focus on the initial period of the transition. The next, concluding, chapter will offer some recommendations on how the arguments presented thus far can be incorporated into U.S. national security policy.

Notes

1. The relationships derived in previous chapters are for the general case of small options against defended targets, not just for ballistic missile defense.

2. Despite the robust nature of Soviet air defenses, a U.S. massive attack (all systems) would overwhelm these defenses with "early" success gradually depleting the defenses—especially the air defenses. But, that is certainly *not* a small attack, which is the purpose of this discussion.

3. "Stealth" is a particularly interesting capability. The statistical argument on attack size versus defense is based on *overwhelming* the defense—thus Flexible Response is negated by even limited effective defenses. However, Stealth *circumvents* the defense and could thus restore the small attack size possibilities. This argument can be extended to *any* offensive system which *circumvents* the defense *with certainty*, thus precluding the dilemma of a wide 90% confidence interval. However, Stealth also can be viewed as crisis destabilizing, if there is not a way to positively determine that an attack is *not* underway—or, if it is underway, its precise size. Certainly, if the objective is a stable transition to a defense-dominant position, then it would be foolish to introduce systems without reviewing their impact on stability. A suitable remedy for Stealth weapons might be placement of observers at home bases under time of crisis to insure that such an attack were not underway. This is not to imply that "stealth" should be abandoned—only to suggest that its impact on crisis stability should be examined and "stabilizing" features incorporated where appropriate.

4. *Incalculability* is the inability to calculate the victim's response, hence adding uncertainty to the risks of aggression.

5. Whether or not nuclear Flexible Response is linked to deterrence outside of NATO is debatable. Certainly the United States and Soviets have managed with great care the handful of situations where direct conflict between their forces was at least possible. However, these sorts of conflicts have continued through the use of surrogate forces. The conflicts have thus not been "deterred," but they have been suppressed in their intensity and, generally, confined geographically. Flexible Response certainly does not deter these surrogate wars. The possible loss of Flexible Response, and the impact of that loss on deterrence beyond NATO, is considered too vague to be considered in this paper.

6. One might, however, expect a resurgence of European aspirations for a Multi-Lateral Nuclear Force as contemplated in the 1960's; but, this would also be expected with a U.S. shift to Massive Retaliation.

X
Synthesis

This section will offer a path for the *immediate* future which is intended to dampen the apprehensions associated with the less desirable characteristics of a movement to strategic defense. The underlying assumption is that a defense dominant position if sufficiently beneficial to both superpowers, that it is worth exploring, but that the transition period is so fraught with obstacles that some sort of pacing and structure is prudent before beginning the transition.

As presented in this analysis, the SDI is essentially an opportunity to change the mechanism of deterrence from one of punishment by offensive countervalue and counterforce retaliation to one of denial of attack objectives through active defense. Many recent writers, even where critical of SDI, concede that the final objective of a defense dominant environment would be at least as "safe" as today's structure. However, as long as powerful offensive weapons remain in the inventories of the superpowers, the "transition period" will be fraught with apprehensions from all nations involved.

It is partly for this reason that it is imperative to perform policy analysis in conjunction with the more publicized technical research. Given the massive offensive arsenals, the long history of mistrust and tension between the United States and the U.S.S.R., and the time available before many of these technologies are even demonstrated in forms feasible for weapons, there is no good reason for either nation to surprise the other with an abrupt move. It is this author's opinion, then, that a negotiation process should accompany both nations' pursuit of strategic defenses.

In particular, both the Soviets and the United States have legitimate concerns which must be addressed relative to either side introducing strategic defense. The United States is properly concerned that the Soviets have a greater, immediate, potential to "breakout" of the ABM Treaty and produce a moderately effective preferential or non-preferential (territorial) defense. In addition to the fact that the Soviets have the only operational ABM system, U.S. apprehensions stem from a long list of perceived Soviet violations of the intent of the ABM Treaty. These include: test firing of the SA-5 and SA-2 missiles to altitudes in excess of 100,000 feet (too high for manned bombers);

production of the SA-12; construction of a large phased array radar(s) in the interior of the U.S.S.R.; considerable research into, and perhaps testing of, "new technologies" which might be adapted to an ABM mission; and, possession of a massive air defense network throughout the Soviet Union. The United States is thus vitally concerned that the Soviets might seize an opportunity to implement strategic defense over the near term and abruptly affect the Flexible Response strategy or carry out the "BLACKMAIL" scenario.

On the other hand, the Soviets appear to be extremely sensitive to the possibility that the United States might exploit its historical technological superiority and upset the strategic balance over the long term.[1] The Soviets have seen the United States pace the arms race on a technological basis through introduction of MIRV's, submarine capabilities, and nearly every other aspect of qualitative improvement of weapons systems.

Both parties, then, seem to have some degree of interest in preservation of aspects of the ABM Treaty, albeit different aspects and for different purposes. Adherence to the ABM Treaty, however, is no longer entirely congruent with the purposes for which it was established in 1972.

Specifically, the Treaty was a part of a three-fold concept which was *supposed* to lead to balanced offensive force reductions. These three concepts were: a guarantee that all offensive forces were "invulnerable" to disarming preemption (no offensive counterforce existed); a guarantee that retaliation forces would be able to reach their targets (hence no defense, except perhaps against accidental or third party attack); and, that, given the first two conditions, both Parties possessed more than enough strategic offensive forces to provide for deterrence, as each interpreted it. These three conditions being satisfied, offensive reductions were and are *theoretically* possible. But, not only were the offensive reductions not accomplished, the necessary (theoretical) conditions for offensive reductions are now absent because the new ballistic missiles provide prompt counterforce. Put simply, if offensive reductions are desired, then the environment needs to be modified to create the theoretical conditions associated with SALT I/ABM.

The immediate problem, at least for the United States, is how to ensure survival of the land-based ICBM; the longer range issue is whether or not active defense can be incorporated into the overall strategic environment and still maintain national security objectives. The ABM Treaty, both in a practical and philosophical sense, seems to offer a medium to address both of these issues.

Specifically, the United States might *immediately* deploy a limited ABM facility to protect the "vulnerable" ICBM retaliatory capability, while remaining compliance with the ABM Treaty. The technology exists, was demonstrated recently on the Western Test Range, and would limit pressure to expand deployment of the M-X. Recall that even a low level of defense

effectiveness so compounds the attacker's problem that a "cheap" disarming strike is eliminated. If more detailed calculations indicate that 100 interceptors would be insufficient, the United States could propose a Treaty amendment, increasing the number of interceptors, at a single site, to sufficiently protect the ICBM retaliatory capability. (It appears from this analysis that the number of interceptors is a far less influential variable than either the number of sites protected or the geographic area defended.)

Simultaneous with this step, the United States *might* be prepared to cancel M-X, and perhaps the D-5, if the Soviets eliminate their prompt counterforce capability (SS-18/19 and, possibly SS-24/25). This will probably be difficult to accomplish, but if both Parties understand the rather disastrous concept of offensive counterforce, and the "model" position which results from balancing offensive counterforce, perhaps some common ground for agreement can be reached. If either, or both, of these steps can be achieved, the regime of the ABM Treaty may be recreated.[2]

However, further movement toward a defense-dominant environment demands creative modification of the Treaty—which, again, must address both Parties' concerns if agreement is to be achieved. The intent, here, should be to allow detailed exploration of technical and political feasibility of strategic defense and to dampen apprehensions of a "breakout." The following modifications are offered:

1. Change Article II, item 1, to read: "For the purpose of this treaty, an ABM system is any system which attempts to impede the flight of a ballistic missile prior to launch, or from launch to warhead detonation. In this context, ABM systems may be either offensive systems which are capable of destroying ballistic missiles prior to launch [generally described as accurate or "heavy" ICBM's] or defensive systems, capable of intercept after launch. Defensive ABM systems currently consists of:" [Remainder unchanged]
2. Delete Article V, item 1. Modify and incorporate Agreed Interpretation and Unilateral Statement (E) into the Treaty as Article V, item 1, now reading: "In order to insure fulfillment of the obligation not to deploy ABM systems and their components except as provided in Article III of the Treaty, the Parties agree not to deploy systems or components of systems based on other physical principles."
3. Change Article XV, item 2, sentence 2 to read, "it shall give notice of its decision to the other Party five years prior to withdrawal from the Treaty."

The intent of these proposals is first, to obtain agreement that *offensive* systems constitute a ballistic missile defense as much as do the "current systems," as presently defined. Second, given that "research, development and testing" are probably indistinguishable, the agreement should only prohibit deployment. Deployment is both verifiable by National Technical Means and incontestable. This also has the effect of allowing free exploration of the technologies necessary to create a defense-dominant world—where defenses will contribute to certainty of offensive failure rather than uncertainty of offensive success. Third, by requiring five years rather than six

months for abrogation, the concerns of both Parties over breakout should be alleviated.

The five year period for abrogation could also have a subtle influence on military force planning. With a six month clause, the DoD is constantly pressured to plan for the contingency of a rapid Soviet breakout; hence both offensive and defensive R&D programs can justifiably be accelerated, or continued, using the logic of a six-month "recovery" period. A five year clause *might* relieve some of the programmatic pressure, on both ideas of the world, and facilitate rightful political control over the process.

Maintaining political control over a potential sweeping change in the international security environment is more than simple Clausewitzian semantics. This analysis has taken the approach that SDI *could* be viewed as a way to change the mechanism for achieving deterrence—from the offense-dominated countervalue or counterforce approach to one of counterforce through active defense. Other possibilities also exist and include using defense to augment damage-limitation objectives and thus perhaps achieve a successful first strike. Arm waving, finger pointing and inflamed political rhetoric confuse and confound our ability to distinguish between the paths being pursued. We need hard headed, unbiased analysis of at least the issues and concepts raised in this paper followed by open discussion between the superpowers. We need time, not pressure.

This concludes my study of the Strategic Defense Initiative. I believe that the final objective of a defense-dominant world is worthwhile for both the Soviets and the United States. However, I still do not have a firm personal conclusion on whether or not the transition period is manageable—politically. I am also convinced that the deterrent environment will change rather rapidly once defense is introduced. These changes are neither automatically in U.S. interests nor to our detriment; the same can be said from the Soviet perspective. There is no doubt in my mind that both Parties are going to explore the strategic defense concept aggressively and that current agreements do not facilitate that exploration. Instead, I believe there is great incentive for both Parties to build destabilizing offensive forces while *also* exploring defense: these forces will further complicate the transition period. It is in this light that I recommend that the ABM Treaty be modified to serve as a medium for exploring strategic defense. I also suggest, strongly, that both Parties honestly grapple with the issue of offensive counterforce as legitimate element of deterrent force structure.

Notes

1. Although President Reagan has said he would "give the technology to the Soviet Union," many security experts doubt whether this is feasible. First, this act would represent transferring the most

advanced technology to an adversary under unprecedented conditions. Second, simple transfer of technology does not guarantee proper *application*, hence the objective of mutual security may not be achieved by the transfer. However, if mutual security is viewed in the aggregate, other means of "capability sharing" might be contemplated. For instance, a space battle station (constellation) might be placed under international control with the mission of *terminating all* ballistic missile launches unless prior permission for entry into space was obtained. This sort of "veto only" control system would undoubtedly be controversial, but it might provide for mutual security without a transfer of technology. Another option might include joint observation, monitoring, of "testing."

2. Recall, however, that these weapons *presently* have great utility, making their elimination quite a difficult prospect. Defenses *may* be necessary, to some degree, to lower their utility.

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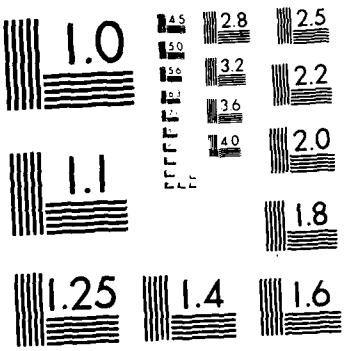

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